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THE PHILIPPINE JOURNAL OF SCIENCE

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THE ILOKO KITCHEN

By MORICE VANOVERBERGH

Belgian Missionary, Baguio, Philippine Islands

In this paper we shall give a list of the Iloko terms most generally used in or with reference to the kitchen. We shall first give the substantives which contain a verbal particle, and afterwards the complete list, in which, however, Spanish terms will not be included.

SUBSTANTIVES INCLUDING VERBAL PARTICLES

The Iloko are quite consistent and use the forms of the present and those of the past as they should be used. This statement may seem very strange, but let us explain.

A substantive denoting a kind of food is not supposed to have either a present or a past form; but, as we have stated above, some of these substantives include verbal particles which have these two forms. Now the Iloko will use a verbal particle in the present form, whenever it accompanies a stem, which indicates an action that has TO BE performed, and one in the past form, whenever it accompanies a stem, which indicates an action that has BEEN performed. Let us come to the examples.

Both "ti kanén" and "ti inapúy" mean: the rice, and both are used as simple substantives. You can say that you eat "ti kanén" and "ti inapúy," and you can say as well that you ate "ti kanén" and "ti inapúy." However, "kanén" includes a substantival suffix in the present form (suffix EN), and "inapúy" includes the same in its past form (infix IN); and the reason is that "kanén" is derived from the stem "kan" (eating), an action that has TO BE performed after the object indicated by the whole substantive (*kanén*) is ready, while "inapúy" is derived from the stem "apúy" (fire), an action (the action of

the fire) that has BEEN performed when the object indicated by the whole substantive (*inapúy*) is ready.

It is true that "kanén" is also a verb meaning: to eat, and "apuyén" (the present form of *inapúy*) a verb meaning: to cook, and that both verbs have a form for the past tense, but that is not to the point, as we are talking about words that are used as simple substantives. We shall see more of these in the list that follows.

The three verbal particles used in the formation of these substantives are—

1. The substantival suffix EN (past: infix IN), which conveys the notion of a simple action.

2. The substantival suffix AN (past: infix IN and suffix AN), which conveys the notion of a locative.

3. The substantival prefix I (past: prefix IN), which conveys the notion of an instrumental.

All of them retain their original notion in the substantives we are talking about. We shall now explain one example for each of the three; the others will be seen in the course of this paper.

1. *Kinirúg*, from the stem *kirúg* (roasting) and the infix IN (past form): a dish consisting of something that has been roasted (simple action).

2. *Dinanumán*, from the stem *danúm* (water) and the infix IN combined with the suffix AN (past form): a dish consisting of something that has been cooked in water (locative).

3. *Indadáñg*, from the stem *dadáñg* (warming) and the prefix IN (past form): a dish consisting of something that has been warmed, with which the action of warming has taken place (instrumental).

The prefix PA, which indicates order, permission, causing to happen, etc., is often combined with these particles into PINA (past form of PA . . . EN), PINA . . . AN (past form of PA . . . AN) and INPA (past form of IPA). This will be seen in some of the examples that follow.

SUFFIX EN

ammarúy(en). Cold cooked rice, dried in the sun.

(in)añgér. Boiled food. Vegetables, fish, and, more especially, meat that have undergone no other preparation than that of having been boiled in water.

(in)apúy. Rice, cooked rice; the staple food of the Iloko. From the stem *apúy*, fire. "To cook" is *lutoén*, from *lúto*, cooking in general; "to cook rice" is *apuyén*, *agapúy*. Uncooked rice is *bugás*, unhusked rice *pigay*.

(pina)blád. Dry corn cooked in water until it becomes mealy. From the syncopated stem *bellád*, becoming mealy, swelling (of rice). The prefix PA means: causing to happen.

b(in)oñgón. Any article of food wrapped in leaves, either of bananas or of palm trees, for example: cooked rice, fried meat, *sinámak*-pudding, etc. *Boñgón* means: wrapping, package.

b(in)utáy. Rice, either ground or pounded into powder. It is never as fine as wheat flour.

d(in)aŋgdéŋŋ. A dish consisting of fish or vegetables or both cooked in water, seasoned with salt and sometimes with onions, *piás* (*Averrhoa bilimbi*), etc., and served with their juice. The commonest ingredients are vegetables and *boŋgóoŋŋ* (preserved fish).

(do)dom(én). Immature rice, roasted before it is pounded. From the stem *doóm*, eating raw, immature rice. Cfr. *(in)irób-(an)*.

g(in)úlay. A dish consisting of vegetables cooked in water, and seasoned with vinegar and raw tomatoes. The vegetables are: leaves and fruits of the cowpea, leaves of the camote, or sweet potato, flowers of the *katúday* (*Sesbania grandiflora*), etc.; not: flowers of the squash, etc.

inum(én). Beverage, drink. For example: wine, beer, gin, coffee, tea, etc.; more especially: water.

k(in)altí. Camotes, or sweet potatoes, unripe papayas, unripe bananas, etc., cut into slices and cooked in sugar.

kan(én). Rice, bread. Staple food, as opposed to meat, fish, vegetables, etc., which are called *sidá*. From the stem *kan* or *kaán*, eating.

(kan)kan(én). Sweet, bread, biscuit, cake, pudding, etc. Anything made of flour, and all sweets or desserts in which rice is the principal ingredient. Desserts in which eggs, milk, etc., are the chief ingredients are called by the Spanish term: *dulce*, sweet. From *kanén;* the reduplication adds the notion of similarity to the original term. *Kankanén* means literally: something resembling the *kanén* (rice, bread), something having one or more characteristics of the *kanén*, but not the real *kanén*.

(pina)khét. A dish consisting of all kinds of vegetables (chiefly egg plant and *pariá* or *Momordica charantia*), mixed with meat, fish (often *boggóong*), or both, and seasoned with tomatoes, onions, lard, etc. All ingredients are cooked together. From the stem *kebbét*, crumpling.

k(in)elnát. A dish consisting of underdone, boiled meat.

k(in)irúg. Roasted coffee, popped corn, popped and unhusked *diket*-rice (a kind of very oily rice), etc. From the stem *kirág*, roasting.

l(in)amáw. Killed hogs, chickens, etc., on which boiling water is poured to facilitate scraping off the hair or pulling out the feathers.

(pina)láw. A sweet consisting of *diket*-rice (a kind of very oily rice), either ground or pounded into powder, kneaded into the form of short sausages, and cooked in sugar and water. From the stem *lettáw*, appearing.

l(in)iŋgtá. Fish, eggs, vegetables, etc., cooked in water; not: meat. Cfr. *(in)aŋgér*.

l(in)úgaw. Rice porridge. Rice cooked in more than the ordinary amount of water.

p(in)áis. Thin biscuits of various colors and shapes, made of rice, either ground or pounded into

powder, and water. The dough, which is very thin, is poured out on banana leaves and cooked in a pan; then the leaves are taken off and the biscuits are exposed to the sun for a couple of days, after which they are fried in lard or coconut oil. These biscuits, which are quite insipid, are colored indigo, red, brown, yellow, green, etc., by adding dyeing matter to the dough. The green color is obtained from the leaves of the camote, or sweet potato; the indigo color from the indigo plant; the red color from the seeds of the annatto tree (Spanish *achuete* or *achiote*; American Indian *achiotl*).

p(in)akáti. Strong infusion obtained by boiling leaves, flowers, etc., in water for a long time. This is used only for medicinal purposes.

p(in)ekkél. A handful of cooked *diket*-rice (a kind of very oily rice), either ground or pounded into powder, fried in lard or coconut oil, after which melted sugar is poured over it. *Pinekkél* also means simply: a handful of rice.

p(in)uyó. A kind of rather consistent, flat cake, usually either oblong or round, made of rice, either ground or pounded into powder, water, and sugar; it is fried in lard or in coconut oil. *Payó* means: swelling up.

s(in)alapósop. A kind of pudding, either soft or more or less hard, made of rice that has been pounded to pieces (not powder), water, sugar, and coconut meat. It is cooked in a section of bamboo, which is placed on a strainer over an earthenware jar, in which water is kept boiling. *Salapósap* means: vapor bath.

s(in)anglâw. A dish consisting of small pieces of beef, mutton, etc. (not: pork, chicken, etc.), cooked in water, to which a small amount of vinegar has been added.

s(in)igáng. A dish consisting of fish and camotes, or sweet potatoes, cooked in water and seasoned with sour ingredients, for example: *piás* (*Averrhoa bilimbi*), fruits of the tamarind, etc.

s(in)isi. Lard, rendered fat of swine, commonly called *manteca* (Spanish). The process of extracting the lard by frying is called: *sisién*.

s(in)úman. A kind of soft pudding made of *diket*-rice (a kind of very oily rice), sugar, and *gatá* (obtained from coconut meat). It is cooked in the pan and eaten with a spoon or fork. It is very often preserved in banana leaves, in which case each preserved part takes the shape of a sausage.

t(in)adtád. Fish cut into pieces, minced meat, chopped vegetables, etc. From the stem *tadtád*, cutting into pieces.

t(in)ápay. Baked dough, for example: bread, biscuits, etc. Cfr. (*kan*)*kanón*.

t(in)iklád. Slices of camotes, or sweet potatoes, taro rhizomes, etc., dried in the sun and then cooked in water and stirred until they become mushy.

t(in)óla. A dish consisting of chicken cut into pieces and small pieces of unripe papayas, cooked together and served with the broth. This is the commonest first dish at banquets and special dinners. *Tóla* means: depreciating something in order to drive away competitors.

t(in)ongbô. A kind of sweet consisting of rice, either ground or pounded into powder, and sugar, cooked in joints of young *bólo*-bamboo (*Schizostachyum mucronatum*) exposed to an open fire.

t(in)úno. Broiled or roasted meat, fish, etc., toasted bread, etc. It is stuck on a piece of bamboo or wire and held over live coals. Cfr. (*in*)*pugpúg*.

SUFFIX AN

(in)asin(án). Any kind of salted food. *Asin* means: salt.

b(in)ubúd(an). A kind of milky, rather sweet, alcoholic beverage, obtained from rice. To prepare it the Iloko mix some yeast or *búbud* with a certain amount of cooked rice; then they place the rice in a jar, and after a couple of days it produces the beverage called *tápuy* or *binubúdan*. The same name is applied to the fermented rice, which is almost as highly alcoholic as the juice.

d(in)anum(án). A dish consisting of roasted (cfr. *tinúno*) fish, cooked in water and seasoned with sour ingredients, for example: *pídis* (*Averrhoa bilimbi*), fruits of the tamarind, etc. From the stem *danúm*, water.

(dinar)dará(an). A dish consisting of small pieces of meat, often very fat, cooked in blood. *Dára* means: blood.

d(in)uydúy(an). A kind of sweet made of boiled ripe squash, mixed with coconut meat and either sugar or salt.

(in)iróh(an). Immature rice, roasted before it is pounded. The Iloko either eat it that way (cfr. *dodomén*) or use it instead of *díket*-rice to prepare *sinúman*-pudding. Cfr. *(in)kiwar*.

l(in)ubi(án). A kind of sweet made of *dippig*-bananas, *díket*-rice (a kind of very oily rice), rasped coconut meat, and sugar. The bananas and the rice are cooked separately, then both are placed in the mortar together with the coconut meat and smashed with the pestle, after which sugar is added, and the whole is again thoroughly mixed with the pestle; then it is eaten with a spoon or fork.

(pinap)pait(án). A dish consisting of raw beef, mutton, etc. (not: pork, chicken, etc.), seasoned with *pápait* (thick juice obtained from the bowels of ruminants). From the stem *pait*, bitterness.

p(in)espes(án). A dish consisting of raw beef, mutton, etc. (not: pork, chicken, etc.), seasoned with food eaten by ruminants and taken out of their stomach. *Pespés* means: pressing out.

pippi(án). A dish consisting of meat and rice cooked in banana leaves. The Iloko first roast rice (cfr. *kinirúg*) and then smash it in the mortar (cfr. *lebbekén*); at the same time they cook meat seasoned with *pídis* (*Averrhoa bilimbi*), and then wrap portions of meat and rice in banana leaves in the same way as *sinúman latík* is wrapped. These packages are cooked in water.

PREFIX I

(inpa)burék. Boiled water. *Burék* means: boiling.

(in)dadáng. Rewarmed food (*nidá* or *inapúy*), water, etc.

(in)damdám. *Túpig*, camotes, yams, etc., baked in hot ashes.

(inpa)kseť. Rice, meat, etc., exposed to the action of fire until they get scorched. From the stem *kesséť*, scorching, burning.

(in)kiwar. A kind of pudding prepared in the same way as *sinúman*, except the *díket*-rice, which is replaced by *dodomén* (immature rice roasted before it is pounded). *Kíwar* means: stirring.

(in)piálo. A sweet consisting of rice, either ground or pounded into powder (as fine as possible), water, and sugar kneaded into

balls and cooked in shards of a *burnáy* (large earthenware jar).

(in)pugpúg. Roasted or broiled meat, etc. It is placed directly on the fire, not on live coals, without any implements. Cfr. *tímpa*.

ILOKO WORDS OF COMMON USE IN THE KITCHEN

Four other particles will appear here and they need a word of explanation:

1. The verbal infix UM: an adjectival infix indicating a slighter action than the common prefix AG of neutral verbs. The latter does not occur in this list, while the former does, perhaps because a good many actions performed in the kitchen are of comparatively short duration (?).

2. The prefix NA of adjectives (past form of the adjectival prefix MA of verbs), sometimes combined with the suffix AN.

3. The prefix APAG meaning: recently, scarcely, etc.

4. The verbal infix AN indicating frequent repetition of the action.

(apag)abhát. Evaporated before it is cooked thoroughly. This is said only of rice boiled in water.

alunús(en). To eat meat, fish, vegetables, etc., any kind of *sídi*, without rice or bread.

ammarúy(en). Cfr. Suffix EN.

ampáw. A kind of sweet. *Diket*-rice (a kind of very oily rice) is ground or pounded into powder and cooked in lard until it swells and forms a hollow ball; then it is rolled in popped *diket*-rice, which has been steeped in melted sugar. *Ampáw* means also: empty shell, nut, etc.

(in)añgér. Cfr. Suffix EN.

(in)apúy. Cfr. Suffix EN.

árak. Wine, gin, whisky, etc. The fermented juice of grapes and any alcoholic beverage obtained by distillation.

(in)asin(án). Cfr. Suffix AN.

(na)áta. Not cooked thoroughly. This is said of rice; but *naáta* means also: immature, unripe, etc.

(na)ati(anán). Evaporated, dried out, waterless.

badúya. A kind of rather consistent, flat cake, made of rice, either ground or pounded into powder, water, sugar, and slices of bananas (the variety called *dippíg*). It is fried in lard or in coconut oil, and, except for the bananas, its taste is the same as that of the *pinyó*.

bagnét. Pieces of fat out of which lard has been extracted, and which have undergone no further preparation.

balikuteá. White-yellowish masses of sugar, made from the boiled sap or juice of the sugar cane, before it has become entirely hard; it is distended and contorted into masses of various shapes, generally coils or esses. At first they are hard, but soon they become brittle, and later on soft. This term is not genuine Iloko: *bali* enters the composition of several Iloko stems that imply the notion of turning, but the rest of the term *balikuteá* is probably derived from some Spanish term, perhaps panocha, ears of certain plants.

(basa)básа. Cooked rice to which water has been added, but no salt. From the stem *basá*, wetness,

The reduplication affects the place of the accent (*báasa* means reading); this occurs very rarely in Iloko, although it is quite common in some other Philippine dialects.

bási. A kind of alcoholic beverage obtained from *bennál* or juice of the sugar cane. To prepare it the Iloko boil *bennál* together with bark of the Java plum or jambool, which gives the *bási* its distinctive brown color; then they pour it out into large earthen jars, adding a certain amount of yeast or *búbud*, and leave it to ferment.

bayo(én). To pound rice in the mortar (with a pestle), to husk it. In some places rice is called *bináyo*, husked, instead of *bagás*.

(pina)blád. Cfr. Suffix EN.

bennál. Sap or juice of the sugar cane obtained by crushing the latter.

bibíñgka. A kind of soft, flat cake, made of *díket*-rice (a kind of very oily rice), either ground or pounded into powder, sugar, and *gettá* (obtained from coconut meat). It is cooked in the same way as the *póto*, but the earthen pot used for the *bibíñgka* is larger than the one used for the *póto*.

boggóoñg. A kind of preserved fish, much relished by the Iloko and used to season their food, which often consists, besides rice, of otherwise tasteless vegetables. The fish (any kind, but more especially *ipon*, a kind of very small, white fish just out of the spawn, and *bilís*, a kind of sardine) is first salted (one part of salt and two of fish and water), thoroughly kneaded, and then let ferment in large earthen jars. Sometimes, before it is salted, the fish is kept a couple of days until it gets spoiled.

bukáyo. A kind of sweet made of coconut meat and sugar. It is cooked in a large earthen pan with round bottom and then usually transferred to coconut shells, where it cools and becomes hard. Sometimes it is cut into small cubes.

b(in)oñgón. Cfr. Suffix EN.

(na)btóor. Badly roasted. When roasting (cfr. *tinóno*) meat or fish, and the outside is scorched or burned, while the inside is still raw. From the stem *bottóor*, startling. Cfr. *(na)kusél*.

búbud. The yeast used in the preparation of *binubúdan* or *tápay* and *bási*. This yeast is obtained from rice, either ground or pounded into powder, mixed with ginger and old yeast; it is laid away for two or three days and then exposed to the sun, after which it forms a kind of dry, brittle, white cake.

b(in)ubúd(an). Cfr. Suffix AN.

(inpa)burék. Cfr. Prefix I.

busí. Popped corn or *díket*-rice (a kind of very oily rice). It is very often thrown into a pan of liquefied sugar, over the fire, and then generally formed into balls.

b(in)utáy. Cfr. Suffix EN.

(in)dadáñg. Cfr. Prefix I.

dáiñg. Salted fish dried in the sun. This term is applied to small fishes dried in their entirety. Cfr. *dalañgdáñg* and *tápa*.

dalañgdáñg. Large fishes, cut open, salted, and dried in the sun. Cfr. *dáiñg* and *tápa*.

(in)damdám. Cfr. Prefix I.

danúm. Water.

d(in)anum(án). Cfr. Suffix AN.

(dinar)dará(an). Cfr. Suffix AN.

d(in)eñgdéñg. Cfr. Suffix EN.

digó. Juice, broth. Juice of meat, etc., and more especially: liquid in which some article of food has been boiled, for example: meat, fish, vegetables, etc., not rice (cfr. *seggét*). The same term is sometimes applied to the juice or sap of the coconut, etc.

(díla)díla. A kind of soft, flat, tongue-shaped cake, made of rice, either ground or pounded into powder, and water. It is cooked in water, and, when the cake is transferred to a plate, a small mass of rasped coconut meat and one of sugar are placed separately in front of it. *Dila* means: tongue; the reduplicated form: something resembling a tongue.

diró. Honey.

dodót. A kind of pudding, made of rice, either ground or pounded into powder, *gettá* (obtained from coconut meat), and sugar. Everything is put in a pan, first *gettá* and sugar, and then rice, and stirred while it is cooking.

(do)dom(én). Cfr. Suffix EN.

d(in)uydúy(an). Cfr. Suffix AN.

(upagan)em-ém. Beginning to get warm, but not yet boiling. This is applied to water. The stem *em-ém* means: pressing one's lips.

gátas. Milk.

gettá. The milk contained in coconut meat and obtained by pressing the latter.

gípang. A sweet made of cooked *diket*-rice (a kind of very oily rice). The rice is dried in the sun, then fried in lard until it pops, and finally thrown into a pan of liquefied sugar, over the fire, after which it is cut into lozenge-shaped cakes.

g(in)úlay. Cfr. Suffix EN.

gúpi. A dish consisting of small pieces of meat, liver or lung, cooked in lard and vinegar.

inum(én). Cfr. Suffix EN.

(in)irúh(an). Cfr. Suffix AN.

ittip. Crust of rice, namely: the rice that adheres to the bottom of the earthen jar in which it is cooked.

kalámay. A kind of sweet made of rice, either ground or pounded into powder, sugar, and water. It is cooked in a pan and stirred continually until it becomes thick and more or less consistent. It is eaten with a spoon and very often preserved in small coconut shells of the *mukapuná*-variety: to do this the coconut is cut into halves, which are emptied, filled with *kalámay*, and put together again, a piece of colored paper being pasted all around to keep the two halves together.

kalasakós. A sweet consisting of cooked *diket*-rice, coconut meat, and sugar. After the rice has been cooked, it is pounded in a mortar, and then spread open over some hard, even surface, so as to take the appearance of a huge pancake; after this the coconut meat and the sugar are sprinkled over the cake, and the latter is cut into rectangular sections.

kaltamú. Preserved fish (cfr. *hagpóong*), which has not been in the jar long enough and has not yet fermented sufficiently.

k(in)alti. Cfr. Suffix EN.

kan(én). Cfr. Suffix EN.

(kan)kan(én). Cfr. Suffix EN.

kúring. Cfr. *dáing*.

(pina)khét. Cfr. Suffix EN.

k(in)elnát. Cfr. Suffix EN.

(inpa)ksét. Cfr. Prefix I.

kilaw(én). To eat raw (meat or fish).

(kiring)kiring. A sweet consisting of rice, either ground or pounded into powder, and sugar. It is cooked in lard or coconut oil and takes all possible forms: round, oval, ringlike, oblong, etc.

k(in)irúg. Cfr. Suffix EN.

(pa)ksíw. A dish consisting of meat or fish seasoned with vinegar and cooked in a small quantity of vinegar mixed with salt, until the liquid has evaporated. From the stem *kisiw*, convulsion, curving.

(in)kíwar. Cfr. Prefix I.

(na)kusél. Half-cooked. This may happen to rice, *sinúman*, etc., when the jar is overfull, and only the upper part is cooked thoroughly, while the rest is not. Cfr. *(na)-útáor*.

l(in)amáw. Cfr. Suffix EN.

lána. Coconut oil.

lebbuk(én). To smash, to pound in the mortar (with a pestle), for example: cooked rice, bananas, roasted immature rice (*dodomén*), etc. Cfr. *bayoán*.

(pina)ltáw. Cfr. Suffix EN.

(na)línay. Cooked thoroughly, even though it be still moist. This is said only of rice. Cfr. *(apag)-abbát*, *(na)áta*, and *(na)kunél*.

l(in)iñgtá. Cfr. Suffix EN.

l(um)uág. To foam, to scum.

l(in)ubi(án). Cfr. Suffix AN.

l(in)úgaw. Cfr. Suffix EN.

luto(én). To cook (in general). Cfr. *(in)apúy*.

nípa. An alcoholic beverage obtained from the juice of the nipa palm (*Nipa fruticans*) by distillation.

ókoy. A kind of very consistent cake, made of rice, either ground or pounded into powder, chives leaves, *kúros*-shrimps, salt, and lard. It is fried in lard, harder than the *badúya* and drier than both the *badúya* and the *pinuyá*.

ópia. Soft, rather consistent cakes made of *diket*-rice (a kind of very oily rice), either ground or pounded into powder, and sugar. They are molded into different shapes, simply round or taking the form of diminutive men, horses, etc., and resemble small loaves, the lower side being flat and the upper side rounded; these cakes are hollow inside, and there sesame seeds cling to the dough; the upper side is ornamented with seeds (half black and half scarlet) of the *bugayóng* (*Abrus precatorius*), which, however, are not eaten, as they are purely ornamental.

p(in)áis. Cfr. Suffix EN.

(pinap)pait(án). Cfr. Suffix AN.

p(in)akáti. Cfr. Suffix EN.

patúpat. Cfr. *s(in)ámam ipus*.

patúpat ti sinubláu. A kind of soft pudding made of *diket*-rice (a kind of very oily rice) and sugar. When it is preserved it is wrapped in plaited pinnæ of palm leaves and each preserved part takes the shape of a diminutive brick. *Patúpat ti sinubláu* means literally: *patúpat* of the *sinubláu*, a large iron pot with rounded bottom.

p(in)ekkél. Cfr. Suffix EN.

p(in)espes(án). Cfr. Suffix AN.

(in)piálo. Cfr. Prefix I.

pippi(án). Cfr. Suffix AN.

póto. A kind of soft cake, made of rice, either ground or pounded into powder, water, sugar, and yeast, with the occasional addition of coconut meat, eggs, etc. It is cooked in a cylindrical earthenware pot with a flat bottom; the pot is covered with a piece of tin plate, and fire is applied on all sides, above, and underneath.

(in)pugpúg. Cfr. Prefix I.

p(in)uyó. Cfr. Suffix EN.

sagpáw. A dish consisting of fish and vegetables. The vegetables are cooked first, then the fish is added, either raw or cooked, and the whole is cooked again.

s(in)alapúson. Cfr. Suffix EN.

s(in)añgláw. Cfr. Suffix EN.

saruмsám. Anything that is eaten, either between meals or as a dessert, for example: fruits, cakes, sweets, etc.; any kind of food that is neither *kanén* nor *sída*.

seggél. Water in which rice has been boiled.

sidá. Any article of food that is eaten with rice, or sometimes with bread, for example: meat, fish, vegetables, etc. This term very often simply refers to fish (*ikán* in Iloko), either alive, dead, or cooked, probably on account of the preference of the Iloko for fish as *sidá*. Rice has the preëminence among all other kinds of food, therefore it is called *kanén* (food) or *inapúy* (something that has been exposed to the action of fire, or cooked food); and so also fish has the preëminence among all other kinds of *sidá*, as the Iloko sometimes refer to it simply as *sidá*.

s(in)igáng. Cfr. Suffix EN.

s(in)isi. Cfr. Suffix EN.

sukà. Vinegar. The native vinegar is obtained by the fermentation of dilute *bási*.

s(in)úman. Cfr. Suffix EN.

s(in)úman ipus. A kind of soft pudding made of *diket*-rice (a kind of very oily rice), *gettá*, obtained from coconut meat, and salt. It is preserved in banana leaves, each preserved part taking the shape of a cone. *Ipus* means: tail.

s(in)úman latik. The same as the preceding, except that no *gettá* is mixed with it, that the vender gives you sugar and rasped coconut meat when you buy it, and that the cones are flattened when it is rolled up in banana leaves.

t(in)adtád. Cfr. Suffix EN.

tagapulót. Sugar. It consists of the sap or juice extracted from sugar cane by crushing the latter, and then boiled. The *tagapulót* is either a dark brown, siruplike liquid (*panáyu*), a yellow or brown powder (*barisañgsáñg*), or a dark brown hard substance in the form of a small, much flattened hemisphere (*tinápay*). Refined, white sugar is called by the Spanish terms *azúcar* or *refinado*.

tamúlis. A dish consisting of any kind of small fish (*ipon, bagsét, talibokó, monámon*, etc.), seasoned with vinegar, salt, and ginger, wrapped in banana leaves in the same way as the *sinúman latik*, and cooked in a small amount of water.

túpa. Thin slices of meat, salted, occasionaly dipped in vinegar, and dried in the sun. Cfr. *dáñg* and *dalañgdáñg*.

t(in)ápay. Cfr. Suffix EN.

tápuy. Cfr. *b(in)ubúd(an)*.

t(in)iklíd. Cfr. Suffix EN.

t(in)óla. Cfr. Suffix EN.

t(in)oñgbó. Cfr. Suffix EN.

tubá. The sap of the buri palm (*Corypha elata*) obtained by cutting off its terminal bud, or cabbage.

t(in)úno. Cfr. Suffix EN.

túpig. A kind of sweet made of rice, either ground or pounded into powder, and sugar; the dough is rolled up in banana leaves, into the form of sausages, and placed in the oven or in hot ashes.

ugáda. A dish consisting of slices of young bamboo shoots and *boggóñg* (preserved fish), cooked in the juice of rasped coconut meat that has been kneaded, with the addition of a little water.

EXTRACT FROM SILKWORM PUPÆ: A USEFUL SUBSTITUTE FOR MEAT EXTRACT IN THE PREPARATION OF BACTERIOLOGIC CULTURE MEDIA.

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In a previous communication(1) the writer announced the usefulness of ordinary culture media in which the meat extract or the meat infusion, as usually employed, has been substituted by material that is easily obtainable in nature at practically no cost. During the process of raw-silk production the killed silkworm pupæ accumulate as refuse. As Japan is a leading country in silk production, this material is available in this country in unlimited quantities even in the remotest parts. Useful disposal of this refuse of Japan's main home industry has been found in utilizing it as fertilizer, as feed in poultry raising, and in fish culture.

The high content in protein matter of the pupæ, the convenience with which it can be obtained, and its extreme cheapness have suggested to the writer the investigation already mentioned,(1) with the view to ascertain the usefulness of dead silkworm pupæ as a substitute for meat in the preparation of culture media for bacteriologic purposes. Early experiments have pointed out that, in addition to the advantage of an economic nature, this culture medium may leave nothing to be desired when compared with media prepared of meat extract.

Since the time of our early experiments (1930) further experiences have accumulated and prompted the publication of this final report.

CHEMICAL COMPOSITION OF SILKWORM PUPÆ

The chemical composition of silkworm pupæ has been determined by Oshima,(3) as given in Table 1.

Some differences in chemical composition were found with various species. Even with the same species variations in the chemical composition were found when silkworm crops of different seasons of the year were analyzed. These specific and seasonal variations, however, in no way influenced their usefulness for the culture media.

TABLE 1.—*Chemical constituents of silkworm pupæ (Harugo).*[a]

	Per cent.	Per cent.
Dry matter	33.48	100.00
Crude ash	1.38	4.13
Ether extract	10.59	31.62
Total nitrogen	2.95	8.82
Protein N	2.61	7.89
Nonprotein N	0.34	0.93
Insoluble N	2.52	7.54
Soluble N	0.43	1.28
Protein N	0.09	0.25
Basic N	0.08	0.23
Ammonia N	0.01	0.02
Chitin N	0.10	0.30
Chitin N plus chorionin N	0.15	0.45
Quality of oil:		
Acid value	10.65	
Iodine value	87.08	

[a] From Oshima, S., Report Imp. Fisheries Inst. 23: 145.

Thus the spring crops (Harugo) were found to have the highest food value, the autumn crops (Akigo) being next but still superior to the food value of the silkworm pupæ gathered in summer (Natsugo). Table 1.)

PREPARATION OF THE PUPÆ MATERIAL FOR CULTURE MEDIA

The dead pupæ are air- and sun-dried until they can be easily crushed between the fingers. They are then ground into a dry fine powder.

PREPARATION OF THE MEDIA

LIQUID EXTRACT OF THE PUPÆ MATERIAL

To 1 liter of tap water 100 grams of dried ground pupæ material is added. This suspension is boiled one hour and left in a steam sterilizer for one hour. It is then filtered through paper. Thus a clear yellowish brown liquid extract is obtained, from which the usual liquid or solid medium can be prepared.

In order to determine the most suitable concentration of the three important constituents of ordinary culture media—namely, the extract, the peptone, and the sodium chloride—the following experiments were performed.

Search for a suitable concentration of pupæ extract (Table 2).—Four concentrations of the extract were employed in the strength of 50, 25, 10, and 5 per cent. To these 1.5 per cent of agar was added. From the results of the test (Table 2) it is evident that the lowest concentration that gave satisfactory

growth of the bacteria tested was 10 per cent. In these experiments the culture medium contained only pupæ extract and agar and the reaction was adjusted to pH 7.2.

TABLE 2.—*Results of tests made with the view to determine the suitable concentrations of pupæ material.*

(Incubated twelve hours at 37° C.; +, growth; —, no growth.)

Species of bacteria employed.	Concentration of pupæ.					
	70 per cent.	50 per cent.	25 per cent.	10 per cent.	5 per cent.	Control.
Bacillus typhosus						
Bacillus paratyphosus A						
Bacillus paratyphosus B						
Bacillus coli communis						
Bacillus dysenteriæ Shiga						
Bacillus dysenteriæ Flexner						
Bacillus dysenteriæ Y						
Staphylococcus citreus						
Staphylococcus aureus						
Staphylococcus albus						

TABLE 3.—*Results of tests made with the view to determine the suitable concentrations of sodium chloride (10 per cent pupæ).*

Species of bacteria employed.	Concentration of sodium chloride (NaCl).				
	None.	0·25 per cent.	0·5 per cent.	1·0 per cent.	Control.
Bacillus typhosus					
Bacillus paratyphosus A					
Bacillus paratyphosus B					
Bacillus coli communis					
Bacillus dysenteriæ Shiga					
Bacillus dysenteriæ Flexner					
Bacillus dysenteriæ Y					
Staphylococcus citreus					
Staphylococcus aureus					
Staphylococcus albus					

Search for a suitable concentration of sodium chloride (NaCl) (Table 3).—In this test the concentration of the extract was maintained constant at 10 per cent, and the amount of salt was varied from 0.25 to 1 per cent.

Two kinds of controls were included in this test—namely, one containing pupæ extract only and no salt, while an ordinary meat extract-peptone-salt medium was used also for comparison.

The result of this test showed that the bacteria employed grow on the pupæ-extract media, which contained 0.5 per cent NaCl

better than without salt, but almost just as well as on the ordinary meat-extract media containing besides 0.5 per cent NaCl also peptone.

Search for a suitable concentration of peptone (Table 4).—In this test the concentration of pupæ extract and that of NaCl remained constant and the peptone content was varied.

TABLE 4.—*Results of tests made to determine the suitable concentration of peptone (10 per cent pupæ).*

Species of bacteria.	Concentration of peptone					
	0.5 per cent.	0.75 per cent.	1.0 per cent.	2.0 per cent.	Contrast.	Notes.
Bacillus typhosus	+ + +	+ + +	+ + +	+ + +	+ + +	+ +
Bacillus paratyphosus A	+ + +	+ + +	+ + +	+ + +	+ + +	+ +
Bacillus paratyphosus B	+ + +	+ + +	+ + +	+ + +	+ + −	+ + +
Bacillus coli communis	+ + +	+ + +	+ + +	+ + +	+ + +	+ + +
Bacillus dysenteriæ Shiga	− + +	− + +	+ + +	+ + +	+ + +	+ +
Bacillus dysenteriæ Flexner	+ + +	+ + +	+ + +	+ + +	− − +	− +
Bacillus dysenteriæ Y	+ + +	+ + +	+ + +	− − −	+ + +	+ +
Staphylococcus citreus	+ − −	+ + +	+ + −	+ + +	+ + +	+ + +
Staphylococcus aureus	+ + +	+ + +	+ + +	+ + +	+ + +	+ + +
Staphylococcus albus	− + +	+ + +	+ + +	+ + +	− + +	+ + +

Four concentrations of peptone were made; namely, 0.5, 0.75, 1, and 2 per cent. One control medium contained pupæ extract (10 per cent) only, and the other one was the usual ordinary meat-extract medium containing peptone and salt.

TABLE 5.—*Correlations of the concentration of materials.*

	Tap water.	Pupæ.	Peptone.	Sodium chloride (NaCl).
	cc.	g.	%	g.
No. 1	1,000	300	10	5
No. 2	1,000	300		
No. 3	1,000	100	20	7
No. 4	1,000	100		7
No. 5	1,000	100	5	5
No. 6	1,000	100	20	7
No. 7	1,000	100	5	7
No. 8	1,000	100		5
No. 9	1,000	300		7
No. 10	1,000	300	20	5

Table 6 summarizes the results of this test, which show that 0.5 per cent of peptone added to pupæ extract gives results as satisfactory as the ordinary meat-extract medium does.

TABLE 6.—*Growth of bacteria on each medium as given in Table 5.*

Species of bacteria.	Medium No.— 1	2	3	4	5
Bacillus coli communis	+ +	+ +	+ − +	+ + −	− + +
Bacillus typhosus	+ + +	+	+ + +	+ + −	+ + +
Bacillus paratyphosus A	+ +	+ +	+ − +	+ + −	+ + −
Bacillus paratyphosus B	+ +	+ +	+ − +	+ + −	+ + −
Bacillus dysenteriæ Shiga	+	+	+ + +	− +	+ + −
Bacillus dysenteriæ Flexner	+ +	+ (?)	+ + −	− +	+ + −
Bacillus dysenteriæ Y	+ − (?)	+	+ + −	+	+ + +

Species of bacteria.	Medium No. 6	7	8	9	10	Control.
Bacillus coli communis	+ − +	+ + +	+ + +	+ + +	+ + +	− + +
Bacillus typhosus	+ + +	+ +	+ + −	+ + +	+ + −	+ + +
Bacillus paratyphosus A	− + +	+ − +	+ + −	+ + +	− +	+ + −
Bacillus paratyphosus B	+ + +	+ + +	+ + − +	+ + +	− −	+ + −
Bacillus dysenteriæ Shiga	− +	+	+ −	+ +	+	+ − +
Bacillus dysenteriæ Flexner	+ +	+	+	−	−	− + +
Bacillus dysenteriæ Y	+ +	− + +	− +	+	+	+ + −

THE KINDS OF BACTERIA USED FOR THE TEST AND THE PROCEDURE OF TESTING

The following kinds of bacteria have been used for the test: *Bacillus typhosus, B. paratyphosus* A and B, *B. coli communis, B. dysenteriæ* Shiga, Y, and Flexner, and *Staphylococcus aureus, S. citreus,* and *S. albus.*

PROCEDURE

The purity of the cultures used having been first of all assured, a standard-loopful of growth on ordinary agar slant was suspended in 10 cc of sterilized salt solution. One loopful of this suspension was planted on an agar slant of pupæ extract and one on a meat-extract agar slant. Incubation at 37° C. for twenty-four and forty-eight hours followed and the abundance of growth was compared. The results of this test are tabulated and show that there was no appreciable difference in the luxuriance of growth on either medium.

TEST FOR BIOLOGIC HARMLESSNESS AND EVENTUAL TOXICITY OF THE MEDIUM MADE OF PUPÆ EXTRACT

Pupæ-extract broth was used for this test. By injecting the broth both subcutaneously and intraperitoneally into rabbits, mice, and guinea pigs it was ascertained that it is biologically inert inasmuch as no untoward effect followed the injections.

INQUIRY INTO THE EFFECT OF PUPÆ EXTRACT ON THE VIRULENCE OF BACTERIA GROWN ON IT

No difference in virulence of *B. typhosus* or *B. dysenteriæ* was found between the cultures grown on pupæ-extract media and those grown on meat-extract media.

TEST OF ANTIGENIC PROPERTIES OF BACTERIA GROWN ON PUPÆ-EXTRACT MEDIA

This test was performed in two directions. To test the antigenic property in vivo and in vitro one rabbit was immunized with *B. typhosus* grown on pupæ-extract agar and another one with the same bacterium grown on meat-extract agar. Suspensions were made of the two cultures each grown on the different media and cross agglutination was performed. Although the two sera thus obtained showed slight differences in their strength due to individual variation of the animals used, the results of tests in which the two suspensions were used with the same serum were the same, showing that the antigenic property of the same culture remained the same, whether grown on pupæ- or meat-extract culture media.

For the sake of brevity and for the reason that these tests showed no differences in their usefulness, the detailed records are not given, only the summary results.

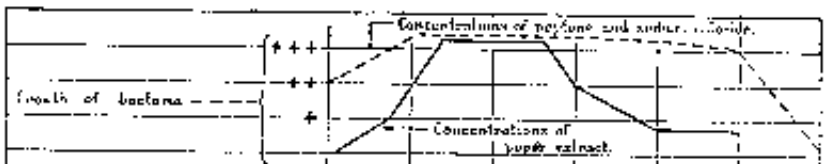
Likewise the data concerning our tests of the usefulness of pupæ extract for preparation of special media are omitted for the same reason. The tests consisted in preparing and testing the following culture media: Endo's medium, Drigalski-Conradi, Russell's double sugar medium, and Gassner's, Barsickow's, Löffler's, and Petroff's media. These tests indicated that the pupæ extract is a suitable substitute for meat extract even in these special media.

The usefulness of this substitute that had been established by the author years ago (1930) having been reascertained by this recent investigation, the next step was to prepare the pupæ extract in such a form that it could be stored indefinitely and used conveniently whenever needed. We have therefore prepared an inspissated extract by evaporating it with the help of heat and vacuum to the consistence of a thick paste. In this form the substitute presents a soft brownish paste of lighter color than beef extract, it is readily dissolved and forms a slightly turbid, easily filtrable, liquid of the color of ordinary bouillon. Its smell recalls that of molasses rather than that of beef extract. To assure ourselves of the keeping quality we placed some of the extract paste into a wide-mouth sterilized container, closed it with a sterilized stopper, sealed it with par-

affin, and stored it in an ice chest. After having been stored for a full year, the pupæ extract has not changed its physical qualities, and biologic test showed it to be equal to beef extract.

The test at the end of a year's storage was arranged in such a manner that ordinary agar was prepared out of the extract, deep plates were poured and upon solidification the entire surface was divided into eight segments by drawing lines on the outside bottom of each plate and properly marking each segment thereon.

TABLE 7.—*Correlations of materials and bacterial growth.*



Peptone per cent	——	0.5	0.75	1.0	1.5	2.0
Sodium chloride (NaCl) do	0.25	0.5	0.75	1.0	1.5	2.0
Pupæ do	5.00	1.0	2.00	50.0	70.0	100.0

The plates were then planted with 24-hour cultures of various stock cultures in such a way that a small standard loopful of each culture was set in the middle of each segment without spreading it at all.

TABLE 8.—*Growth of media made of extract of pupæ stored for one year in an ice chest.*

Species of bacteria.	Pupæ.		Ordinary.	
	24 hrs.	48 hrs.	24 hrs.	48 hrs.
	cm.	cm.	cm.	cm.
Bacillus coli	0.57×1.06	0.68×1.14	0.43×0.6	0.67×0.75
Bacillus typhosus	0.42×0.9	0.46×1.0	0.53×0.65	0.72×1.20
Bacillus paratyphosus A	0.88×1.17	0.46×1.20	0.42×0.55	0.65×0.6
Bacillus paratyphosus B	0.65×0.6	0.6 ×0.6	0.38×0.52	0.52×0.72
Bacillus dysenteriæ Shiga	0.65×0.78	0.58×0.78	0.4 ×0.4	0.48×0.48
Bacillus dysenteriæ Flexner	0.4 ×1.42	0.45×1.46	0.4 ×0.47	0.42×0.59
Bacillus dysenteriæ Y	0.45×0.78	0.5 ×0.83	0.4 ×0.52	0.5 ×0.59
Vibrio choleræ	0.45×0.9	0.96×0.45	0.34×0.4	0.4 ×0.6
Bacillus pyocyaneus	0.9 ×0.84	1.07×1.0	0.56×0.7	0.84×0.9
Bacillus prodigiosus	0.55×0.78	0.58×0.62	0.5 ×0.7	0.65×0.75
Diplococcus pneumoniæ *	0.47×0.65	0.49×0.65	0.32×0.37	0.5 ×0.42
Streptococcus *	0.5 ×0.5	0.52×0.67	0.39×0.47	0.46×0.59
Corynebacterium diphtheriæ	0.4 ×0.79	0.44×0.94	0.4 ×0.5	0.45×0.55

* 1 per cent glucose added.

Thus a round growth developed in each segment, the dimensions of which varied with the various kinds of bacteria used; they could, however, be conveniently measured. The measurements are given in Table 8, the two figures indicating the longest and the shortest diameter of the same round growth on the plates. The same manner of inoculation having been applied to plates of beef-extract agar, a comparison between the two media became possible. The result of this test is self evident and needs no further elucidation.

In order to illustrate the economic advantage of the pupæ-extract media, we affix the prices of materials as they prevail in Japan. The price relation is about 25: 130.

TABLE 9.—*Prices of materials.*

Material.	One l of ordinary agar.		One l of pupæ agar.	
	g.	sen.	g.	sen.
Meat	500	94.00		
Pupæ			100	0.45
Sodium chloride (NaCl)	5	0.21	5	0.21
Peptone	10	23.60	5	11.80
Agar	25	12.00	25	12.00
Total		129.21		24.46

SUMMARY

Experiments and experiences extending over five years have convinced us that the extract made from silkworm pupæ, a waste product of the silk industry, is in every respect of equal value, at times superior, to the beef extract in preparation of bacteriologic culture media. The reduction of expense resulting from the use of this substitute for laboratories that are engaged in the preparation of typhoid or cholera vaccines on a large scale amounts to about 75 per cent of the cost of culture media.

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THE PHILIPPINE FERNS COLLECTED BY J. B. STEERE

By E. B. Copeland

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This collection was a part of the subject of a paper by M. W. Harrington.[1] By the kindness of the late Prof. J. B. Pollock, I received a set of fragments of these ferns many years ago, and published some notes on them.[2] There are several reasons for a review now of the entire collection. Philippine botany has reached the stage where local distribution has an interest which could not be given to it thirty years ago; the labels show the locality in many cases in which it was not published; the labels differ from the published list in some cases, and are more likely to be correct; a few species are missing in the published list; some identifications require correction; and a revision of the synonymy may be helpful. The species follow in Harrington's sequence and with his names. The revised or corrected names are in italics.

CYATHEA SPINULOSA Wall.

Balabac, on low hills. The fragment is reasonably like some material from Assam, and also some specimens from Capiz, collected by Edaño. This is the only published record of the species from the Philippines.

ALSOPHILA LATEBROSA Hooker.

Mount Banahao, which is called "Mt. Mahayhay" on these labels. This species is *Cyathea latebrosa* (Wall.) Copel.

HYMENOPHYLLUM THUIDIUM Harr.

Mountains of Panay, growing on trunks of trees. Not collected again there, but we have very similar specimens from Mindanao and New Guinea. This is perfectly illustrated by Borbe's drawings in my monograph of *Hymenophyllum*.[3]

HYMENOPHYLLUM POLYANTHOS Swartz.

Mountains of Panay. This is typical *H. blumeanum*, in the reduction of which to *H. polyanthos* I concur.

[1] Journ. Linn. Soc. 16 (1877) 25.

[2] Philip. Journ. Sci. § C 2 (1907) 405.

[3] Philip. Journ. Sci., in a following issue.

HYMENOPHYLLUM JAVANICUM Sprang.

Mount Banahao. This is exactly *H. subdemissum* Christ, which also I reduce to *H. polyanthos*.

HYMENOPHYLLUM DILATATUM Swartz.

Mount Banahao, "new to this locality." However, this is the same as *Cuming 112*, which bore the same name and might have come from the same place. It is *H. badium* H. and G.

HYMENOPHYLLUM TUNBRIDGENSE Smith.

Mount Banahao. Very small and sterile; probably juvenile *Meringium meyenianum*. Real *H. tunbridgense* is unknown in the Philippines.

HYMENOPHYLLUM FRATERNUM Harr.

Mountains of Panay. Not *H. fraternum* Presl, and therefore renamed *H. Steerei* C. Chr. I consider it to be *H. (Mecodium) fimbriatum* J. Sm.

HYMENOPHYLLUM NEESII Hooker.

Luzon. *Hymenophyllum denticulatum* Sw.; common on Mount Banahao.

TRICHOMANES PARVULUM Poir.

Mount Banahao. *Gonocormus minutus* (Blume) V. D. B.

TRICHOMANES DIGITATUM Swartz.

Mount Banahao, "very high among the conifers, on trunks of trees like moss." In this, Professor Pollock distinguished No. 1, which is a form of *T. digitatum* with broad segments; and No. 2, which is a form of *Gonocormus minutus*.

TRICHOMANES PALLIDUM Blume.

Mount Banahao.

TRICHOMANES AURICULATUM Blume.

The published source is Luzon. There are two specimens. Of one, the label reads Isabela de Basilan, and the identification is correct. The other is from the mountains of Panay, and the collection was probably mixed; my fragment is *Cephalomanes oblongifolium* Presl.

TRICHOMANES SMITHII Hooker.

Mount Banahao. *Abrodictyum Cumingii* Presl.

TRICHOMANES APIIFOLIUM Presl.

Typical, from Mount Banahao; much reduced, but fertile, from mountains of Panay.

TRICHOMANES RIGIDUM Swartz.

Mountains of Panay. *Trichomanes obscurum* Blume.

DAVALLIA PEDATA Smith.

Mount Banahao. *Humata repens* (L. f.) Diels.

DAVALLIA AFFINIS Hooker.

"Locality new;" Mount Banahao. This is *Araiostegia hymenophylloides* (Blume) Copel., listed separately by Harrington, but not so sent to me. My three Cuming specimens of "*D. affinis*" are from Luzon, the only specified type locality.

DAVALLIA VESTIGA Blume.

Mount Banahao. *Humata vestiga* (Blume) Moore.

DAVALLIA PULCHELLA Hooker.

Luzon. Not seen.

DAVALLIA REPENS Desv.

"P. I." Probably *Lindsaya Merrillii* Copel.

DAVALLIA CONTIGUA Swartz.

Luzon. Not seen. (*Prosaptia.*)

DAVALLIA ELEGANS Swartz.

Mount Banahao. *Davallia embolostegia* Copel.

DAVALLIA (MICROLEPIA) PHILIPPINENSIS Hart.

Mount Banahao. This is *Tapeinidium philippinense* (Harr.) C. Chr.[4] Later collections on Banahao are *Elmer 7973* and *9024*. I do not know how to distinguish *T. moluccanum* C. Chr. or what *Dicksonia linearis* Cav. is.

LINDSAYA CONCINNA J. Sm.

"P. I." The label is *L. cultrata*, but the specimen is *L. concinna*, as published.

LINDSAYA LOBATA Poiret.

"Luzon and Balabac and Philippines." Not seen.

LINDSAYA DAVALLIOIDES Blume.

Mountains of Panay "on the ground in small clusters." Veins almost wholly free.

ADIANTUM LUNULATUM Burm.

Balabac. *Adiantum philippense* L.

CHEILANTHES TENUIFOLIA Swartz.

Balabac.

PTERIS INCISA Thunb.

Luzon. Not seen. (*Histiopteris.*)

[4] Index Suppl. (1934) 176.

LOMARIA AREOLARIS Harr.

"Growing in leaves of *Pandanus*, village of Mahayhay." *Stenochlaena areolaris* (Harr.) Copel.[3]

ASPLENIUM NIDUS Linn.

"Growing on ground among conifers." Probably *A. ficifolium* Goldm.

ASPLENIUM WIGHTIANUM Wall.[4]
ASPLENIUM TENERUM Forster.

Mount Banahao.

ASPLENIUM LUNULATUM Swartz.

Mountains of Panay. Also *A. tenerum*.

ASPLENIUM STEEBEI Harr.

Mount Banahao. This is exactly *A. laxivenum* Copel. (1907), and *A. pseudofalcatum* var. *subintegra* Ros. (1915), of Formosa. Some, but not most, forms of the Hawaiian *A. pseudofalcatum* Hilleb. (1888) are indistinguishable from it. The Hawaiian species is best regarded as distinct.

ASPLENIUM AFFINE Swartz.

Mount Banahao.

ASPLENIUM CULTRATUM Mett.

Luzon. *Athyrium cultratum* (Presl) Milde; fairly common on Banahao, and unknown elsewhere.

ASPLENIUM RESECTUM Sm.

Asplenium unilaterale Lam. Not published as a Philippine collection, but the label reads "Mts. of Panay, on trees."

ASPLENIUM BANTAMENSE Baker.

Balabac. *Athyrium fraxinifolium* (Presl) Milde.

DIDYMOCHLAENA LUNULATA Desv.

Mountains of Panay. *Didymochlaena truncatula* (Swartz) J. Sm.

ASPIDIUM ACULEATUM Swartz.

Mount Banahao. Probably *Polystichum moluccense* (Blume) Moore.

ASPIDIUM ARISTATUM Swartz.

Mountains of Panay. *Polystichum aristatum* (Forster) Presl.

[3] See Philip. Journ. Sci. § C 2 (1907) 406, and Gardens' Bull. S. S. 5 (1932) 262.

[4] See Philip. Journ. Sci. § C 2 (1907) 406.

NEPHRODIUM LUERSSENI Harr.

"Bulukai Island," Philippines. *Dryopteris Luersseni* (Harr.) C. Chr.,[7] but this name must give way to *D. ligulata* (J. Sm.) O. K., the type collections being identical. I remain in doubt as to the identity of *D. Foxii*.

NEPHRODIUM BAKERI Harr.

Mountains of Panay. *Dryopteris Bakeri* (Harr.) Copel.[8]

NEPHRODIUM MOLLE Desv.

Published as from China, but the label reads "Mts. of Panay." My fragment is too small for certainty, but seems to be *Dryopteris diversiloba* (Presl) Christ.

NEPHRODIUM TRUNCATUM Presl.

Luzon. Not seen.

NEPHROLEPIS ACUTA Presl.

Mahayhay village.

NEPHROLEPIS RAMOSA Moore.

Isabela de Basilan. Not seen.

POLYPODIUM UROPHYLLUM Wall.

Balabac? *Dryopteris urophylla* (Wall.) C. Chr.

POLYPODIUM (GONIOPTERIS) AORISTISORUM Harr.

Mountains of Panay. *Dryopteris aoristisora* (Harr.) C. Chr.[9]

POLYPODIUM HERTELLUM Blume.

Luzon. Not seen.

POLYPODIUM CUCULLATUM Nees.

Luzon. Not seen; presumably *Calymmodon gracilis* (Fée) Copel.

POLYPODIUM MINUTUM Blume.

Luzon. Not seen.

POLYPODIUM SCHENKII Harr.

Mountains of Panay. *Polypodium obliquatum* Blume.

POLYPODIUM CRATERISORUM Harr.

Mount Banahao. *Polypodium celebicum* Blume.

POLYPODIUM ADNASCENS Swartz.

"P. I." *Cyclophorus adnascens* (Swartz) Desv.

[7] Vide op. cit. 405. [8] Ibidem. [9] Vide ibidem.

POLYPODIUM (PHYMATODES) HAMMATISORUM Hayt.

Mount Banahao. *Polypodium pyrolifolium* Goldm.

POLYPODIUM HETEROCARPUM Blume var. ZIPPELII H. and B.

"P. I." *Microsorium Zippelii* (Blume) Ching.

POLYPODIUM DIPTERIS Blume.

Mount Banahao. *Dipteris conjugata* Reinw.

POLYPODIUM PALMATUM Blume.

Mount Banahao. It is *P. albido-squamatum* Blume, with inconspicuous lime dots.

POLYPODIUM RUPESTRE Blume.

Mount Banahao. Not in the published list. *Polypodium triquetrum* Blume.

GYMNOGRAMME MACROPHYLLA Hooker.

Luzon. Not seen. (*Colysis.*)

ANTROPHYUM IMMERSUM Mett.

Philippines. Not seen.

ANTROPHYUM CALLAEFOLIUM Blume.

"P. I."

ANTROPHYUM SEMICOSTATUM Blume.

Mount Banahao.

VITTARIA ELONGATA Swartz.

Balabac.

VITTARIA FALCATA Kze.

Luzon. Not seen.

DRYMOGLOSSUM FILOSELLOIDES Presl.

Luzon.

HEMIONITIS ZOLLINGERI Kuhz.

Mountains of Panay. *Hemigramma latifolia* (Meyen) Copel.[10]

ACROSTICHUM LATIFOLIUM Swartz.

Published as Luzon collection, but the fragment sent me is from Peru.

ACROSTICHUM AUREUM Linn.

Balabac. Not seen.

ACROSTICHUM PLATYRHYNCHOS Hooker.

Luzon. *Hymenolepis platyrhynchos* (J. Sm.) Kunze.

[10] Op. cit. 406.

ACROSTICHUM SPICATUM Linn.

Published as from Ternate; label is "P. I." *Hymenolepis sp.*

ACROSTICHUM AXILLARE Cav.

Not in the published list. "P. I." *Leptochilus axillaris* (Cav.) Kaulf., which is common about the foot of Banahao.

LYGODIUM DICHOTOMUM Swartz.

Balabac. *Lygodium circinnatum* (Burm.) Sw.

LYGODIUM SCANDENS Swartz.

"Mahayhay village." The specimen is *L. japonicum* (Thunb.) Swartz, but both species occur about Mahayhay.

ANGIOPTERIS EVECTA Hook.

"Mahayhay village." *Angiopteris angustifolia* Presl.

HELMINTHOSTACHYS ZEYLANICA Hooker.

Balabac.

The list includes two Lycopodineæ, not sent to me:

LYCOPODIUM PHLEGMARIA Linn.

SELAGINELLA sp.

Near *S. caulescens;* "probably a new species."

MISCELLANEOUS NOTES ON PHILIPPINE BOTANY

By E. D. MERRILL

Administrator of Botanical Collections, Harvard University, Cambridge

The data included in the present paper have been compiled over a period of several years as items have come to my attention regarding Philippine and supposed Philippine species that it seemed desirable to place on record. Thus, *Scleria macrophylla* Presl proves not to be a Philippine species, having been based on an erroneously labeled specimen originating in tropical America. *Macaranga sinensis* (Baill.) Muell.-Arg., erroneously supposed to have been based on a specimen from China, actually was based on material from Luzon, and the species does not occur in China; this binomial replaces *M. dipterocarpifolia* Merr. *Vitis cumingiana* Turcz., long considered to be a species of doubtful status, proves to be a synonym of *Bischofia javanica* Blume. The genera *Mezzettiopsis* Ridl., *Munronia* Wight, *Campnosperma* Thwaites, and *Acanthospermum* Schrank are new to the Philippine flora, while *Combretodendron* A. Chevalier (1909) replaces *Petersianthus* Merrill (1916). *Petalonema* Schlechter (1915), being invalidated by *Petalonema* Gilg (1897), was rechristened by Quisumbing in 1930 as *Schlechterinanthus*. It is renamed *Quisumbingia* in honor of Dr. E. Quisumbing, of the Bureau of Science, Schwantes having applied the name *Schlechterianthus* to a genus of aizoaceous plants one year earlier than Quisumbing's use of it for the asclepiadaceous genus.

CYPERACEÆ

Genus SCLERIA Bergius

SCLERIA MACROPHYLLA Presl.

Scleria macrophylla PRESL, Rel. Haenk. 1 (1827) 200; MIQ., Fl. Ind. Bat. 3 (1857) 343; MERR., Enum. Philip. Fl. Pl. 1 (1923) 136; CORE, Brittonia 2 (1936) 37, pl. 3, fig. 25.

Scleria paludosa KUNTH, Enum. 2 (1837) 344.

Scleria macrocarpa SALZM. ex Schlecht., Bot. Zeit. 3 (1845) 492, in syn.; BOECK., Linnaea 38 (1874) 521, descr.

Scleria palmifolia HOFFMGG. ex. Schlecht., Bot. Zeit. 3 (1845) 492.

Ophryoscleria paludosa Nees in Mart., Fl. Bras. 2(1) (1842) 186.
Scleria asperrima Steud., Syn. Pl. Cyp. (1855) 170.
Ophryoscleria asperrima Liebm., Vidensk. Selsk. Skr. 5(2) (1851) 261.

Presl gives the locality, "Hab. in insula Luzon," and his species has been reduced to *Scleria bancana* Miq. This erroneous reduction was made by C. B. Clarke in Hook. f. Fl. Brit. Ind. 6 (1894) 693, perhaps largely on the assumption that Presl's indicated locality was correct; if correct, Presl's specific name would replace Miquel's for the Indo-Malaysian species. However, Presl's description does not remotely agree with the characters of *Scleria bancana* Miq. In excluding the species from the Philippine list in 1922, I stated that from the description it apparently belonged in the group with *Scleria macrocarpa* Nees, and that Presl's type was doubtless from Mexico or South America. Recently, in securing the loan of material for the use of Dr. E. L. Core, who was concerned at the New York Botanical Garden with a monographic study of the species of *Scleria* occurring in North and South America, it occurred to me that an examination of Presl's type would solve the problem of the identity of the species. Through the courtesy of the curator of the herbarium of the National Museum at Prague, we have been permitted to examine the authentic specimen collected by Haenke, on which Presl's description was based. It is labeled as above, but is, as suspected, an American plant and is the same as *Scleria macrocarpa* Salzm. = *S. palmifolia* Hoffmgg. and, further, is identical with the widely distributed tropical American *Scleria paludosa* Kunth. Presl's name being the older is here adopted in place of Kunth's. Presl's type doubtless came from Mexico, where Haenke collected previous to his departure with the Malaspina Expedition for the Philippines. This adjusted synonymy settles the status of another of the numerous originally mislabeled specimens in the collection of the Malaspina Expedition, and *Scleria macrophylla* Presl should disappear from the botanical literature of the Malaysian region. The species extends from Mexico and Central America to Trinidad, Bolivia, and Brazil.

POLYGONACEÆ

Genus POLYGONUM (Tournefort) Linnæus

POLYGONUM TOMENTOSUM Willd.

Polygonum tomentosum Willd., Sp. Pl. 2 (1799) 447.
Polygonum attenuatum R. Br. var. *celebicum* Meisn., Miq. Ann. Mus. Bot. Lugd.-Bat. 2 (1865) 60.

Polygonum cumingianum GANDOGER, Bull. Soc. Bot. France 66 (1919) 224.

Polygonum celebicum DANSER, Bull. Jard. Bot. Buitenz. III 8 (1927) 165, *f.* 6.

If Danser is correct in referring the Philippine material to *Polygonum celebicum* (Meisn.) Danser, as a species distinct from *P. tomentosum* Willd., the former name is unnecessary, for as a binomial it is antedated eight years by *P. cumingianum* Gandoger, the latter species typified by *Cuming 617*. The Philippine *Polygonum tomentosum* Willd. conforms to Meisner's concept of Willdenow's species, if we may judge by the various specimens so named in Meisner's herbarium which is at the New York Botanical Garden.

MENISPERMACEÆ

Genus DIPLOCLISIA Miers

DIPLOCLISIA KUNSTLERI (King) Diels.

Diploclisia kunstleri (King) DIELS, Pflanzenreich 46(iv. 94) (1910) 227.

Cocculus kunstleri KING, Journ. Asiat. Soc. Bengal 58(2) (1889) 334.

Diploclisia macrocarpa GAGNEP. in Lecomte, Fl. Gen. Indo-Chine 1 (1908) 140, pro parte.

CULION, *Herre 1079*, April 29, 1931. Indochina, Malay Peninsula, Borneo; new to the Philippines.

ANNONACEÆ

Genus MEZZETTIOPSIS Ridley

MEZZETTIOPSIS CREAGHII Ridl.

Mezzettiopsis creaghii RIDL., Kew Bull. (1912) 389; Sarawak Mus. Journ. 1(3) (1913) 97; MERR., Journ. Straits Br. Roy. As. Soc. Special No. 353 (1921).

Orophea palawanensis ELM., Leafl. Philip. Bot. 5 (1913) 1721; MERR., Enum. Philip. Fl. Pl. 2 (1923) 167, Univ. Calif. Publ. Bot. 15 (1928) 69, Lingnan Sci. Journ. 14 (1935) 5.

An examination of Ridley's type in the Kew Herbarium shows that it is identical with *Orophea palawanensis* Elm., and Ridley's name is the earlier. In studying my own collection of this species in 1914 and Elmer's Bornean collection in 1926, I realized that no *Orophea* was represented, but I failed then to refer it to any described genus, and so left it in *Orophea*. This monotypic genus is now known from British North Borneo, Palawan, and Hainan, and is represented by the following collections: BRITISH NORTH BORNEO, *Creagh, Elmer 20752, 20948*.

PALAWAN, *Elmer 12858, 12645, Merrill 9227.* HAINAN, *Tsang and Fung 18173, Lau 337.*

MELIACEÆ

Genus MUNRONIA Wight

MUNRONIA HUMILIS (Blanco) Harms.

Munronia humilis (Blanco) HARMS, Ber. Deutsch. Bot. Ges. 35 (1917) 80.

Plagianthus humilis BLANCO, Fl. Filip. (1837) 526.

Turraea humilis MERR., Govt. Lab. Publ. (Philip.) 27 (1905) 30, Enum. Philip. Fl. Pl. 2 (1923) 339.

LUZON.

MUNRONIA PALAWANENSIS (Merr.) Harms.

Munronia palawanensis (Merr.) HARMS, Ber. Deutsch. Bot. Ges. 35 (1917) 80.

Turraea palawanensis MERR., Philip. Journ. Sci. § C 9 (1904) 307.

PALAWAN.

In placing this in *Munronia*, where it apparently belongs rather than in *Turraea*, Harms inadvertently credited *Munronia palawanensis* to me, *Turraea palawanensis* being the binomial I actually published. To validate his new binomial the name-bringing synonym is here supplied. The species is very closely allied to *Munronia humilis* Harms. I overlooked Harms's paper on *Munronia* when preparing the manuscript for my enumeration of Philippine flowering plants.

EUPHORBIACEÆ

Genus MACARANGA Thouars

MACARANGA SINENSIS (Baill.) Muell.-Arg.

Macaranga sinensis (Baill.) MUELL.-ARG. in DC., Prodr. 15(2) (1866) 1001; GAGNEP., Bull. Soc. Bot. France 69 (1922) 705; PAX and HOFFM., Pflanzenreich 63 (IV. 147–VII) (1914) 351.

Adenoceras sinensis BAILL., Étud. Gén. Euphorb. (1858) 430; nomen nudum.

Macaranga dipterocarpifolia MERR., Philip. Journ. Sci. 1 (1906) Suppl. 205, Enum. Philip. Fl. Pl. 2 (1923) 441; PAX and HOFFM., Pflanzenreich 63 (IV. 147–VII) (1914) 338.

Mappa sinensis MUELL.-ARG. in DC., Prodr. 15(2) (1866) 1001, in syn.

Tanarius sinensis O. KTZE., Rev. Gen. Pl. (1921) 351.

This species occurs in the Philippines from the Batan Islands southward through Luzon to Cebu and Camiguin de Misamis, and also is found in Formosa and in Botel Tobago. Baillon apparently adopted the specific name *sinensis* under

some misconception, as his type in the Paris herbarium collected by Collery is clearly labeled, "Manille (Mont. Igorrotes)"—that is, probably in what is now Benguet Province, Luzon. Baillon, who published no description, does not indicate the place of origin, although one would assume from the specific name that he thought it came from China. Pax and Hoffmann's statement, "stammt wahrscheinlich aus Kwangtung," is a mere guess. Curiously both Pax and Hoffmann, and Gagnepain, whose examination of the type clearly indicated the identity of *Macaranga dipterocarpifolia* with the older *M. sinensis*, cite *Mappa sinensis* Baill.; Baillon never published this binomial, but rather *Adenoceras sinensis*. The species can with entire safety be removed from the Chinese list.

Genus BISCHOFIA Blume

BISCHOFIA JAVANICA Blume.

Bischofia javanica BLUME, Bijdr. (1826) 1168.

Vitis cumingiana TURCZ. in Bull. Soc. Nat. Mosc. 31 (1) (1858) 416, PLANCH. in DC., Monog. Phan. 5 (1887) 624; MERR., Enum. Philip. Fl. Pl. 3 (1923) 1 (sp. dub.).

Turczaninow's species was based on *Cuming 1173*, which is *Vitex turczaninowii* Merr., at least in some herbaria. I have not seen Turczaninow's specimen on which the description of *Vitis cumingiana* was based, but the sheet of this number in the Leningrad herbarium is a staminate specimen of *Bischofia javanica* Blume, with a fragment of an inflorescence of *Vitex turczaninowii* Merr. added. It may be noted that Turczaninow's description, "stylo sub nullo, stigmate peltato disciformi antheras tegente," does not apply to *Vitis*, and only approximately to *Bischofia;* it is suspected that Turczaninow misinterpreted the pistillode in the immature staminate flowers that he examined. Planchon erroneously cites the specimen as *Cuming 1113*.

ANACARDIACEÆ

Genus CAMPNOSPERMA Thwaites

CAMPNOSPERMA PHILIPPINENSIS sp. nov.

Arbor circiter 7 m alta, ramulis incrassatis, ultimis saltem 1 cm diametro, ferrugineo-pubescentibus; foliis confertis, sessilibus vel subsessilibus, coriaceis, oblanceolatis vel anguste oblongo-oblanceolatis, circiter 35 cm longis, 8 ad 11 cm latis, subolivaceis, apice rotundatis, deorsum angustatis, basi cuneatis, haud auriculatis, supra glabris vel junioribus secus costam pubescentibus, subtus plus minusve pubescentibus, nervis prima-

riis utrinque circiter 40, valde perspicuis; paniculis foliis subaequantibus, ferrugineo-pubescentibus, multifloris, breviter pedunculatis, ramis primariis usque ad 15 cm longis, patulis vel adscendentibus; floribus 5-meris, distincte (circiter 1.5 mm) pedicellatis, rubro-brunneis, sepalis orbiculari-ovatis, rotundatis, circiter 1 mm longis, glabris vel margine parcissime ciliatis; petalis oblongis, obtusis, glabris, 2.5 mm longis; staminibus 10, filamentis glabris, 1 mm longis, antheris circiter 0.5 mm longis; ovario ovoideo, subobliquo, leviter ciliato vel subglabro, stylis vix m 11 longis.

MINDANAO, Surigao Province, near Placer, *C. A. Wenzel 3199*, March 28, 1928, in forests, altitude about 150 meters.

A species belonging in the group with *Campnosperma griffithii* March. and *C. auriculata* Hook. f., of the Malay Peninsula and Borneo, differing from both particularly in its very much more numerous lateral nerves, the leaves distinctly pubescent beneath, and in its 5-merous flowers. This extension of generic range was to be expected in view of the fact that in Malaysia representatives of the genus were previously known to occur in the Malay Peninsula, Penang, Sumatra, Borneo, New Guinea, and the Caroline Islands.

LECYTHIDACEÆ

Genus COMBRETODENDRON A. Chevalier

COMBRETODENDRON QUADRIALATUM (Merr.) comb. nov.

Terminalia quadrialata MERR., Philip. Journ. Sci. § C 4 (1909) 301.
Petersianthus quadrialatus MERR., Philip. Journ. Sci. § C 11 (1916) 200, Enum. Philip. Fl. Pl. 3 (1923) 141.

Exell, Journ. Bot. 68 (1930) 181, calls attention to the fact that *Combretodendron* A. Chevalier (1909) is congeneric with *Petersia* Welwitch (1867) non Klotzsch (1861), for which I proposed the new generic name *Petersianthus* in 1916. I here transfer the Philippine species to *Combretodendron* as I am confident that it is congeneric with the African species.

PRIMULACEÆ

Genus LYSIMACHIA Tournefort

LYSIMACHIA FRAGRANS Hayata.

Lysimachia fragrans HAYATA, Journ. Col. Sci. Tokyo 30(1) (1911) 175; HAND.-MAZ. in Notes Bot. Gard. Edinb. 16 (1931) 167.
Lysimachia ramosa sensu MERR., Enum. Philip. Fl. Plants 3 (1923) 275, non Wall.

Not having any authentic material representing *Lysimachia ramosa* Wall., I followed Pax and Kunth in referring the

Philippine form to Wallich's species, although the Philippine plant is normally unbranched. Handel-Mazettii is undoubtedly correct in referring the Philippine specimens to Hayata's species, which was described from Formosan material; I have the same species from Kwangtung and Kwangsi Provinces in China.

ASCLEPIADACEÆ

Genus QUISUMBINGIA nom. nov.

Petalonema SCHLTR., 1915, non Gilg, 1897.
Schlechterianthus QUIS., 1930, non Schwantes, 1929.

QUISUMBINGIA MERRILLII (Schltr.) comb. nov.

Petalonema merrillii SCHLTR., Repert. Sp. Nov. 13 (1915) 554; MERR., Enum. Philip. Fl. Pl. 3 (1923) 356.
Schlechterianthus merrillii QUIS., Philip. Journ. Sci. 41 (1930) 342.

A new generic name is manifestly needed for this endemic Philippine asclepiadaceous genus. The new name, here proposed, is dedicated to Dr. E. Quisumbing, chief botanist, Bureau of Science, who first noticed that Schlechter's generic name was a homonym and hence invalid. Gilg used the generic name *Petalonema* in 1897 for an African genus of the Melastomataceæ, which Schlechter overlooked when he named and described the Philippine genus. In 1929 Schwantes proposed the generic name *Schlechterianthus* for an African group of the Aizoaceæ, thus invalidating Quisumbing's substitute name for *Petalonema* Schltr., non Gilg, published in 1930.

RUBIACEÆ

Genus BORRERIA G. F. W. Meyer

BORRERIA ARTICULARIS (Linn. f.) F. N. Williams.

Borreria articularis (Linn. f.) F. N. WILLIAMS, Bull. Herb. Bois. II 5 (1905) 956.
Spermacoce articularis LINN. f., Suppl. (1781) 119, excl. syn. Rumph.
Spermacoce floribunda LOUR., Fl. Cochinch. (1790) 79.
Spermacoce hispida LINN., Sp. Pl. (1753) 102.
Borreria hispida K. SCHUM. in Engl. and Prantl, Nat. Pflanzenfam. 4(4) (1891) 144, non Spruce (1888).
Borreria discolor BARTL. in DC., Prodr. 4 (1830) 545.
Spermacoce mutilata BLANCO, Fl. Filip. ed. 2 (1845) 43.
Spermacoce scabra WILLD., Sp. Pl. 1 (1797) 572.

Prof. W. G. Craib wrote to me in November, 1932, pointing out that *Borreria hispida* K. Schum. (1891) was invalidated by *Borreria hispida* Spruce, a very different species, actually described by K. Schumann in the Flora Brasiliensis three years

earlier, and asking if I had any further information as to the identity of *Borreria discolor* Eartl. I suggested to him that the identity of *Spermacoce articularis* Linn. f. should be settled first, as the description apparently applied to the species under discussion, although the Rumphian illustration cited represented the very different *Hedyotis verticillata* Lam. Professor Craib finds that the specimen of *Spermacoce articularis* Linn. f. in the Linnæan herbarium represents the species commonly known as *Borreria hispida* K. Schum. (*Spermacoce hispida* Linn.), and I accordingly follow him in accepting the binomial *Borreria articularis* (Linn. f.) F. N. Williams for this very common and widely distributed weed.

BORRERIA LAEVIS (Lam.) Griseb.

Borreria laevis (Lam.) Griseb., Fl. Brit. West Ind. 1 (1861) 349.
Spermacoce laevis Lam., Tabl. Encycl. 1 (1791) 273.

Jolo, *Bur. Sci. 44416 Ramos and Edaño*, September, 1924, distributed as *Hedyotis* sp.

A widely distributed species in tropical America, now occurring as a weed in Java, Sumatra, Singapore, New Guinea, New Britain, and Samoa, and doubtlessly in many other parts of the Indo-Malaysian and Polynesian regions. It is, however, of comparatively recent introduction, in most Old World localities, where it now occurs, apparently introduced and disseminated within the present century.

Genus HEDYOTIS Linnæus

HEDYOTIS MONOCEPHALA Miq.

Hedyotis monocephala Miq., Ann. Mus. Bot. Lugd.-Bat. 4 (1869) 255.
Selenomitrion capitatum Miq., Fl. Ind. Bat. 2 (1857) 186, non *Hedyotis capitata* Lam.
Oldenlandia monocephala Boerl. ex Koord., Exkursionsfl. Java 3 (1912) 240, non O. Ktze., 1891.
Hedyotis miqueliana Val., Bot. Jahrb. 44 (1910) 545, descr. ampl.
Hedyotis connata Merr., Enum. Philip. Fl. Pl. 3 (1923) 496, non Hook. f.

Miquel's specific name is valid in *Hedyotis* for I have found no published description of *H. monocephala* R. Br., *nomen nudum*, Wall. List (1829) 213, "846 pro *macrocephala* lege *monocephala*," previous to Hooker's consideration of it, Fl. Brit. Ind. 3 (1880) 63. *Hedyotis macrocephala* R. Br. in Wall. List (1829) No. 846, is a nomen nudum, *H. monocephala* intended; see below. *Hedyotis connata* Hook. f. Fl. Brit. Ind. 3 (1880) 62, (*Oldenlandia connata* K. Schum.) is a false name as he misread *H. connata* Wall. List (1829) No. 856, nomen nudum, and

in this error he was followed by King and Gamble, by myself in my erroneous interpretation of the species in 1923, and by Pitard (sub *Oldenlandia*). An additional specimen is *Bur. Sci. 44323 Ramos and Edaño*, from Tawitawi, Sulu Archipelago, July and August, 1924, distributed as *H. radicans*. It occurs also in Java and in Borneo.

HEDYOTIS BRUNONIS nom. nov.

Hedyotis macrocephala R. Br. in Wall. List (1829) No. 846, nomen nudum (error for *H. monocephala* R. Br.).

Hedyotis monocephala R. Br. in Wall. List (1829) 213, "No. 846 pro *macrocephala* lege *monocephala*"; Hook. f., Fl. Brit. Ind. 3 (1880) 63, non Miq. 1869.

Oldenlandia monocephala O. Ktze., Rev. Gen. Pl. (1891) 292.

Silhet, Assam, and Upper Assam.

Were *H. macrocephala* R. Br. an appropriate name the proper course would be to validate it. However it was published as a nomen nudum, in error, and was corrected to *monocephala* a little later by Brown himself, the latter also a nomen nudum. The specific name "*macrocephala*" is in no way a descriptive one for the species in question, and accordingly it seems appropriate to propose a new one for this distinct species. *Hedyotis monocephala* R. Br. is invalidated by *H. monocephala* Miq.

COMPOSITÆ

Genus ACANTHOSPERMUM Schrank

ACANTHOSPERMUM HISPIDUM DC.

Acanthospermum hispidum DC., Prodr. 5 (1838) 522; Blake, Contr. U. S. Nat. Herb. 20 (1921) 386, *t. 28, f. C.*

Cebu, *Aron Valentin*, October 6, 1929, herb. Stockholm, fragment in the Gray Herbarium. Widely distributed in North and South America, introduced in the Philippines as it is in Hawaii, Australia, and tropical Africa. The allied American *A. australe* (Loefl.) O. Ktz. (*A. brasilum* Schrank) occurs as an introduced plant in Hawaii and in Singapore.

The genus is new to the Philippines.

A FRESH-WATER JELLYFISH IN THE PHILIPPINES

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ONE PLATE

July 12, 1935, Mr. Agustin F. Umali saw a number of jellyfishes in one of the fresh-water nursery tanks that compose the Bureau of Science propagation pond system. After the discovery the contents of the tank were carefully examined daily. Scrapings from the bottom and sides, as well as roots and leaves of plants in the tank, were examined under the microscope. No hydroid form was seen. Although not found, individuals in the hydroid stage must have been present in the tank as small medusæ were seen July 24. These must have been liberated a few days before.

When first seen the medusæ measured about 1.6 mm in diameter and had four sets of tentacles: 4 perradials, which are largest and most prominent; 4 interradials, 8 adradials, and 16 tentacles of the fourth set between the adradials and the perradials and between the adradials and the interradials, a total of 32 tentacles. August 22 they had grown to about 3 mm in diameter with seven sets of tentacles, or a total of about 256. The gonad rudiments were clearly visible as small projections at each junction of the stomach and the radial canals.

The fully grown jellyfish measures 13 to 15 mm in diameter, and the fully developed gonad is about 5 mm long and 2 mm wide. All adult forms examined for sex were males; no female individual was ever found. The jellyfish is very transparent and colorless, except the stomach and the gonads, which are whitish and opaque. The medusæ frequent the bottom of the tank during cool rainy days. They come to the surface during the early mornings when the weather is clear, only to descend to the bottom again when the water becomes warm and the sun bright. August 30 not a single specimen of the jellyfish could be found. They had disappeared as mysteriously as they appeared.

The finding of the jellyfish in this particular tank was strange as it was not found in the other tanks nearby where conditions

appear exactly identical. Nursery tank 2 contains badly trimmed *Hydrilla verticillata*, *Najas palustris*, and *Chara* sp. as these are continually eaten by gourami, which are kept in the tank. Besides gourami the tank contains a number of *Mollencsia* and *Gambusia*. In 1933 this tank was a veritable *Daphnia* tank. All the ponds in the system were built about the middle of 1927. They have a concrete bottom, filled with ordinary loam to a depth of about 1 foot, in which the water plants take root to grow and multiply. The original plants, consisting of *Nymphæa stellata*, *Hydrilla* sp., *Naja* sp., *Chara* sp., *Vallisneria gigantea*, dwarf vallisneria (*Vallisneria* sp.), and *Ottelia alismoides*, planted in the different tanks, came from Taguig, Rizal Province. Some specimens of water lily were said to have been brought from Baguio, Mountain Province, while a few came from Dinalupihan, Bataan. The water used for filling the ponds is ordinary tap water from the mains of the City of Manila. Loss through evaporation is compensated by rain water during the rainy season. The temperature of the water ranges from 27° to 32° C.

The morphological structures of this fresh-water jellyfish conform to those of the genus *Craspedacusta*, which is diagnosed as follows:

Umbrella flattened or hemispherical; stomach flat, with 4 corners; radial canals 4, opening to ring canal which is well developed, seemingly wide and communicating with lumen of tentacles; centripetal canal absent; manubrium more or less rectangular in cross section, with 4 perradial lobes; tentacles solid, over 200, of different sizes, with roots embedded in the exumbrellar gelatinous substance; marginal ring present, connected with the roots of the tentacles; otocyst over 100, with elongations towards the margin of the velum; ocelli, absent. Gonads 4, hanging from the radial canal.

The first discovery of jellyfish inhabiting fresh water was made June 17, 1880, when E. Ray Lankester reported to the Royal Society of England the existence of a remarkable medusa in a tank in a water-lily house in Regent's Park, London. As it was found among plants of tropical origin, and as it flourished under high temperature (90° F.), Lankester deduced that this medusa was a tropical species, probably introduced from the West Indies. He placed the animal among the Trachomedusæ, family Petasidæ, and called it *Craspedacusta sowerbyi*, after Mr. Sowerby, secretary of the Botanical Society of London, who first observed the medusa in the tank. Within a week Mr.

Sowerby sent specimens of the same animal to Allman who, not knowing the previous report of Lankester, called it *Limnocodium victoria.*

The medusa reappeared June 16, 1881, and was the subject of further studies. As in the previous year, although "newly hatched" and young jellyfishes were observed, the mature ones were all males and the various observers were left in ignorance of the female *Craspedacusta* and its hydroid form. Four years later, however, A. G. Bourne reported the existence of a sessile animal with nematocysts attached to the roots of *Pontederia,* which he regarded as the possible hydroid form of *Craspedacusta.* May 11, 1888, or about nine years after the discovery of the adult jellyfish, G. Herbert Fowler observed the actual formation of the medusoids from the hydroid form previously reported by Bourne.

In 1901 Vaney and Conte reported the discovery by Chifflat of numerous jellyfish in a water-lily pond in Parc de la Beta d'or at Lyon, France, while in 1905 E. Boecker reported the existence of an animal identical with *Craspedacusta* in a fresh-water pond full of water lilies (*Victoria regia*) in a warm-water pond in the Botanical Garden of Munich, Germany.

August 17, 1907, C. W. Hargitt, while at Woods Hole, Massachusetts, received from Washington, District of Columbia, a few medusæ which were identified as a species of *Craspedacusta.* September 30, 1907, Hargitt received a letter saying that the medusæ had suddenly disappeared. The specimens had been discovered in the aquarium of W. B. Shaw, a florist, who for many years had cultivated various aquatic plants. The appearance of the medusæ seemed mysterious at the time, as all plants in the tanks were reared from seeds and no grown plants had been at any time imported or introduced from an outside source; no specimen of *Victoria regia* or *Pontederia,* the plants associated with this jellyfish in Europe, had ever been in the Washington tank.

September 26, 1916, numerous medusæ were seen in Benson Creek, near Frankfort, about 28 miles from Lexington, Kentucky, and were reported by H. Garman. After a brief comparison with the various fresh-water medusæ then known, Garman came to the conclusion that it was "best for the present to regard the Kentucky medusae as a form of *C. sowerbyi.*"

In 1918 Payne reported the presence of numerous specimens of a fresh-water medusa and its hydroid form in Boss Lake, near Elkhart, Indiana. The medusæ examined during 1919,

1920, and 1921 were all females, in sharp contrast to other finds where only males were obtained. He obtained sexually mature eggs and was able to follow the development of the jellyfish from the hydroid stage to the formation of the free-swimming medusa. The studies of Payne led him to believe that the animal previously described as *Myerohydra ryderi* and reported by Potts (1897, 1906) was identical with the form he studied. He reduced the genus *Myerohydra* to *Craspedacusta* and called the animal *Craspedacusta ryderi* (Potts).

Oka, in 1907, reported a fresh-water jellyfish from Jantsekiang in the neighborhood of Itschang which he called *Limnocodium kawaii*. He differentiated this from *Craspedacusta sowerbyi* in being much larger, in having a more convex umbrella, and in having seven sets of tentacles, instead of three sets as found in *C. sowerbyi*.

A comparison of the Philippine form of fresh-water jellyfish with those reported in England, Europe, North America, and China leads me to believe that it belongs to the species *Craspedacusta kawaii* (Oka).

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ILLUSTRATION

PLATE 1. *Craspedacusta kawaii* (Oka), a fresh-water jellyfish, drawn from Philippine specimens.

PLATE 1.

DIROFILARIA IMMITIS LEIDY AND ITS CULICINE INTERMEDIATE HOSTS IN MANILA, I

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ONE PLATE

INTRODUCTION

Dirofilariasis immitis, or dog filariasis, is essentially a disease of dogs caused by *Dirofilaria immitis* Leidy, a nematode parasite inhabiting the circulatory system. The name of the disease has been coined accordingly to distinguish it from human filariasis. The life cycle of *D. immitis* may be briefly summarized as follows: The microfilariæ or the filarial embryos, which are liberated by the mature worms in the blood of the dog, are microscopic and motile. The sexually mature filariæ are located generally in the heart. The embryos, when sucked up with the blood by the appropriate mosquito during the act of feeding, migrate from the stomach to the Malpighian tubules. Further development of the embryos in the Malpighian tubules of the mosquito takes place until they reach the infective stage. The infective filariæ are thrown off in the body cavity of the mosquito, from which they make their way to the labium. Sooner or later the infective mosquito bites another dog and the filariæ pass from the labium of the mosquito into the puncture in the skin of the canine host. They then wriggle about and find their way into the circulation from which they reach the heart, where they become sexually mature adults. Unless a mature male and a mature female happen to be together in the same heart, no further development occurs. The embryos liberated by the female in the blood circulate as microfilariæ. Thus the cycle is completed.

[1] I wish to acknowledge the generous assistance and interest of Dr. C. M. Afriza, head of the Department of Parasitology, School of Hygiene and Public Health, University of the Philippines, under whose general guidance the work was carried out. To Dr. P. Villa, veterinarian in charge of the Manila City Pound, for extending to me his facilities in obtaining infected dogs; and to Dr. M. Tubangui, chief of the biological division, Bureau of Science, for his valuable counsel and numerous suggestions and for reading the manuscript of this paper, I record my thanks.

In 1878 Manson expounded the theory that the mosquito might be the vector of *Wuchereria bancrofti* Cobbold. He confirmed a portion of his hypothesis in 1884 when he observed the metamorphosis of the microfilaria within the body of the mosquito. As a result of this brilliant discovery, numerous investigators made further experiments, which finally established the fact that the mosquito is the intermediate host of the filaria.

To Grassi (1900), however, belongs the credit of having discovered the intermediate host of *D. immitis*. This author, while engaged in the study of malaria, had observed filariæ in the body of *Anopheles maculipennis* Meigen, a malarial mosquito. These filariæ were found to be developmental forms of *D. immitis*. To verify his belief Grassi, in 1900, made experimental infections with *D. immitis*. After a year he was able to recover sexually mature filariæ from dogs, which had been bitten by adults of *A. maculipennis* that contained the infective stage of the filaria in their labia. Following the researches of Grassi a number of experimenters in different parts of the world tried to trace the development of *D. immitis* in other species of mosquitoes. The following species are reported as intermediate hosts of the dog filaria in the respective countries indicated:

1. *Anopheles maculipennis* Meigen. Italy.
2. *Anopheles bifurcatus* Linnæus. Italy.
3. *Anopheles hyrcanus* Pallas var. *pseudopictus* Grassi. Italy.
4. *Anopheles superpictus* Grassi. Italy.
5. *Anopheles algeriensis* Theobald. North Africa.
6. *Anopheles hyrcanus* var. *sinensis* Wiedemann. China.
7. *Anopheles punctipennis* Say. United States.
8. *Aëdes ægypti* Linnæus. (*"Stegomyia fasciata."*) Australia.
9. *Aëdes vexans* Meigen. (*"Culex malaria."*) Italy.
10. *Aëdes caspius* Pallas. Italy.
11. *Aëdes koreicus* Edwards. China.
12. *Aëdes canadensis* Theobald. United States.
13. *Aëdes sollicitans* Walker. United States.
14. *Aëdes taeniorhynchus* Wiedemann. United States.
15. *Culex pipiens* Linnæus. Italy.
16. *Culex fatigans* Wiedemann. (*"sitiens."*) Australia.
17. *Culex territans* Walker. United States.

Although it is well known that dogs in Manila are infected with *D. immitis*, no studies have been conducted to test the local species of mosquitoes with regards to their suitability as transmitters of this parasite. During August, 1935, in examinations of dogs in the Manila City Pound, I had an opportunity to isolate dogs with microfilariæ in the blood. With these animals as subjects a series of biting experiments were carried on with

the local culicine species. The results of these experiments with *Culex quinquefasciatus* Say (*C. fatigans* Wied.) and *Stegomyia fasciata* (*Aëdes ægypti* Linnæus) are herein presented.

MATERIALS AND METHODS

The different species of mosquitoes used in this experiment were collected in the vicinity of Manila. The larvæ were reared in white enameled pans with Fleischmann's yeast as food. The pupæ are removed by means of a pipette into glass jars, each covered with a screened lamp chimney. Upon the emergence of the adults the glass jar was replaced by a Petri dish containing moistened cotton. The adults were fed by placing boiled raisins over the screen netting. The raisins were changed daily, and the cotton pad was always kept moist.

The infection experiments were carried on in a rectangular cage made of cheese cloth, which measures 100 by 60 by 155 centimeters. The dog used was lame, and repeated examinations of the blood by a thin smear showed 8,077 and 7,280 microfilariæ per 2 cubic millimeters (taken at 5 p. m., August 20 and 22, 1935).[2] The dog's hair was clipped from an area of about 225 square centimeters on the back of the animal before the biting experiments. The wire-screened cage containing the infected dog was introduced into the large cage, and the starved female mosquitoes were liberated inside. The next morning the engorged females were caught by means of a suction rubber tube and placed in the screened lamp chimneys, where they were fed with raisins and cared for until they were ready for dissection.

The infected mosquitos that were ready for dissection were immobilized with chloroform or ether, and the usual technic of removing the Malpighian tubules by means of dissecting needles was employed. Mosquitoes that died in the earlier stages of infection were dissected and the Malpighian tubules and stomach were examined for the microfilaria. In those that were killed after seven or more days, searches were made for the microfilaria, not only in the Malpighian tubules but also in the head and labium, thorax, and abdomen. Infected specimens were either mounted in Gater's mounting fluid or stained with Giemsa. Specimens that were to be sectioned were placed in Bless's fluid.

[2] For their kindness in furnishing me these data, I am indebted to Drs. E. Y. Garcia and P. Refuerzo, both of the department of parasitology, School of Hygiene and Public Health, University of the Philippines.

DISCUSSION AND RESULTS

EXPERIMENTS WITH CULEX QUINQUEFASCIATUS SAY

Culex quinquefasciatus Say is a very widespread species that occurs in tropical and subtropical countries. In the Philippines it is the commonest species of *Culex* encountered. It breeds in or near houses in sewage-contaminated water, such as that in street ditches of towns and villages, and in clean water, such as rain water in tanks, reservoirs, etc. The adult is a night flier and bites at nightfall.

The mosquitoes in this series of experimental infections were all bred from *C. quinquefasciatus* larvæ and pupæ in the laboratory. They were collected from standing rain water in the basement of the Bureau of Science building.

As shown in Table 1, seven batches of mosquitoes were used in the feeding experiments. Of 149 mosquitoes which fed on the infected dogs from August 25 to September 5, 1935, 108, or 72.4 per cent, were positive for the filaria. The filarial larvæ were found to be in different stages of development in the body of the mosquito. An individual mosquito was counted as positive for filariæ only when all the filarial larvæ found in the body of the culicine host had already attained sexual maturity or when they appeared to be on their way to attain the infective stage. Hu (1931), who made some earlier observations on the host-parasite relationships of *D. immitis* and its culicine intermediate hosts, reported, "it appears that once the microfilaria [æ] have established themselves in the Malpighian tubules, they are generally able to continue their development till they come to full maturity." This conclusion of Hu was applied to the observations herein reported.

The migration of the microfilariæ from the stomach to the Malpighian tubules is accomplished in about twelve hours after feeding. The shortest time in which the larvæ become sausage-shaped is five days, as shown in the results of experiments 3, 6, and 7. The whole development is completed in ten to twelve days; the infective stage in the labium was noted between eleven and thirteen days. This finding is in accord with the findings of Feng (1930), in China, who found that in *Anopheles hyrcanus* var. *sinensis* and *Aëdes koreicus* the whole development of *D. immitis* is completed in ten to fifteen days, and between twelve and fifteen days they proceed forward to the labium.

It is interesting to note also that in the seven batches of mosquitoes tested there appears to be only a slight variation in the percentage infection of the different batches. In expe-

riment 1, 70 per cent became infected; in experiment 2, 66 per cent; in experiment 3, 64 per cent; in experiment 4, 72 per cent; in experiment 5, 69 per cent; in experiment 6, 65 per cent; and in experiment 7, 63 per cent. These results are probably to be expected inasmuch as in this investigation all the batches of mosquitoes were collected from the same breeding place, where the nature of the nourishment for the growth of the larvæ is more or less uniform. This also suggests the possibility that this more or less uniform percentage of infection may be a characteristic peculiar to *C. quinquefasciatus*.

In Plates 1 and 2 are shown the larvæ of *D. immitis* in a portion of a Malpighian tubule and the proboscis of *C. quinquefasciatus*. The Malpighian tubule was photographed eight days after being infected. The temperature varied at that time between 28° and 31° C., and the relative humidity between 85 and 95. The infective larvæ in the proboscis were photographed fourteen days after infection. Not enough of the infective larvæ were measured to give averages, but the two photographed measured, respectively, 32 μ by 864 μ and 29 μ by 896 μ.

EXPERIMENT WITH STEGOMYIA FASCIATA (AËDES ÆGYPTI LINNÆUS)

Stegomyia fasciata has a distribution similar to that of *Culex quinquefasciatus* Say. This mosquito is distinctly domestic in its habits. The larvæ may be found in all kinds of containers where water collects in and around houses, and they prefer fresh clean rain water collected in water barrels, cans, bottles, roof gutters, etc. This species does not seem to like to breed in cesspools or in sewage-contaminated water. The adults bite in the daytime.

The mosquitoes in this experiment were collected from several rain-water barrels. The starved female mosquitoes bred from the larvæ were liberated inside the cage containing the infected dog early in the morning, and the engorged ones were collected late in the afternoon.

The data from this experiment are summarized in Table 2. Dissections were made between the second and seventeenth days after feeding. It is seen that 71 mosquitoes, or 73.8 per cent, of 96 mosquitoes that took blood were positive. This result seems to indicate that, as far as the susceptibility to infection with *D. immitis* is concerned, *Stegomyia fasciata* is probably about in the same group as *Culex quinquefasciatus*. These findings may be regarded as only a coincidence, but the uniformity of the percentage of infection in the different batches in both species must be significant.

The infective stage was found in *S. fasciata* as early as eleven days after the blood meal. Although only a small number of *S. fasciata* was infected as compared with *C. quinquefasciatus*, the intensity of infection is apparent. A large number of specimens of *S. fasciata* having the infective stage showed a higher worm count than that obtained with *C. quinquefasciatus*. In one specimen of *S. fasciata*, fourteen filariæ were found in the labium, two in the head, two in the thorax, and four in the Malpighian tubules.

An attempt was made to compare in a systematic way the development of the parasite in both species, but due to the large number of mosquitoes that had to be dissected daily this was not carried out. However, it was noted in both species that the filariæ, whenever dissections were made in fresh mosquitoes, showed a slow movement by about the seventh or eighth day. About the tenth day there was a slight increase in the motion, and from the eleventh to the fifteenth day the filariæ were extremely active.

SUMMARY AND CONCLUSION

This paper deals with the study of the suitability of *Culex quinquefasciatus* Say and *Stegomyia fasciata* (*Aëdes ægypti* Linnæus), two local species of mosquitoes, as transmitters of *Dirofilaria immitis* Leidy in Manila. The experimental results may be summarized as follows:

1. Of *Culex quinquefasciatus* Say, 149 mosquitoes fed on a carrier were dissected; 108, or 72.4 per cent, of these were infective. In *Stegomyia fasciata* the percentage infection was found to be 73.8 per cent.

2. The development of *Dirofilaria immitis* to the infective stage in the labium was traced in *C. quinquefasciatus* and in *Stegomyia fasciata*.

3. The more or less uniform percentage of infection found in *C. quinquefasciatus* suggests the possibility that it is characteristic of this local species.

4. The suitability of *Stegomyia fasciata* to infection with *Dirofilaria immitis* Leidy is about on the same footing as that of *C. quinquefasciatus* Say. In the former species a large number of specimens showed a heavy worm count.

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TABLE 1.—*Data from dissections of Culex quinquefasciatus Say infected with Dirofilaria immitis Leidy.*

EXPERIMENT 1; 17 MOSQUITOES, FED AUGUST 25, 1933.

Mosquitoes dissected.			Results of dissections and remarks.
Days after feeding.	Died.	Killed.	
1	1		Stomach with many living premature larvæ; a few in Malpighian tubules.
3	1		Stomach with many dead premature larvæ.
7		1	6 premature larvæ (sausage-shaped) in Malpighian tubules.
8		1	7 premature larvæ (sausage-shaped) in Malpighian tubules.
9		1	4 premature larvæ (sausage-shaped) in Malpighian tubules.
10	1		Negative.
13		4	a. 1 specimen positive in Malpighian tubules (calcified). b. 3 specimens negative.
13		3	All positive; 2 mature larvæ in each labium.
14		4	a. 1 mature larva in thorax; 2 mature larvæ in labium. b. 3 mature larvæ in labium. c. 2 mature larvæ in labium. d. 1 mature larva in labium.

EXPERIMENT 2; 18 MOSQUITOES, FED JULY 26, 1933.

1	1		Stomach with a few living premature larvæ; none in Malpighian tubules.
2	2		Stomach with dead premature larvæ; none in Malpighian tubules.
3	3		Both negative.
4	2		Both positive, about 7 premature larvæ in each Malpighian tubule.
5	1		Negative.
6		1	8 premature larvæ (sausage-shaped) in Malpighian tubules.
8		1	7 premature larvæ (advanced sausage-shaped) in Malpighian tubules.
9	1		1 premature larva (advanced sausage-shaped) in Malpighian tubules.
12		1	8 premature larvæ (elongated) in Malpighian tubules.
12		3	a. Positive in Malpighian tubules (calcified). b. 3 mature larvæ in labium. c. Positive in Malpighian tubules (calcified).
14		8	a. 4 mature larvæ in labium. b. 1 mature larva in thorax; 2 mature larvæ in labium. c. 3 mature larvæ in the labium.

TABLE 1.—*Data from dissections of Culex quinquefasciatus Say infected with Dirofilaria immitis Leidy*—Continued.

EXPERIMENT 3; 14 MOSQUITOES, FED AUGUST 27, 1935.

Mosquitoes dissected.			Results of dissections and remarks.
Days after feeding.	Died.	Killed.	
1	2	.....	Both negative in Malpighian tubules.
2	2	.....	Do.
3	2	.....	*a*, 6 premature larvæ in Malpighian tubules. *b*, 8 premature larvæ in Malpighian tubules.
5	.....	1	1 premature larva in Malpighian tubules.
7	.....	1	9 premature larvæ (sausage-shaped) in Malpighian tubules.
9	.....	1	6 premature larvæ (sausage-shaped) in Malpighian tubules.
11	.....	1	4 premature larvæ (elongated) in Malpighian tubules.
12	.....	2	*a*, 2 mature larvæ in labium. *b*, 1 specimen negative.
14	.....	2	*a*, 2 mature larvæ in head. *b*, 4 mature larvæ in labium.

EXPERIMENT 4; 20 MOSQUITOES, FED AUGUST 28, 1935.

2	4	.....	*a*, Malpighian tubules with many living premature larvæ. *b*, 2 specimens negative.
4	1	.....	About 4 premature larvæ in Malpighian tubules.
6	.....	2	*a*, 6 premature larvæ (sausage-shaped) in Malpighian tubules. *b*, 4 premature larvæ (sausage-shaped) in Malpighian tubules.
7	.....	2	*a*, 6 premature larvæ (sausage-shaped) in Malpighian tubules.
9	.....	1	4 premature larvæ in Malpighian tubules.
11	.....	2	6 premature larvæ in Malpighian tubules of each specimen.
12	2	4	*a*, 1 mature larva in labium of 1 specimen. *b*, 2 mature larvæ in labium of 2 specimens. *c*, 3 specimens negative.
13	.....	4	*a*, 4 mature larvæ in labia of 2 specimens. *b*, 2 mature larvæ in labium of 1 specimen. *c*, 1 specimen negative.
14	.....	7	*a*, 3 mature larvæ in labia of 6 specimens. *b*, 1 specimen negative.

EXPERIMENT 5; 26 MOSQUITOES, FED SEPTEMBER 3, 1935.

2	2	.....	Both negative.
6	1	.....	Negative.
8	.....	3	*a*, 4 premature larvæ (sausage-shaped) in Malpighian tubules. *b*, 5 premature larvæ (sausage-shaped) in Malpighian tubules. *c*, 2 premature larvæ (sausage-shaped) in Malpighian tubules.
9	.....	7	*a*, 6 premature larvæ in Malpighian tubules of 2 specimens. *b*, 4 premature larvæ in Malpighian tubules of 2 specimens. *c*, 8 premature larvæ in Malpighian tubules of 1 specimen. *d*, 2 specimens negative.
10	.....	4	*a*, 6 premature larvæ in Malpighian tubules of 2 specimens. *b*, 8 premature larvæ in Malpighian tubules of 1 specimen. *c*, 1 specimen negative.
11	.....	3	*a*, 3 mature larvæ in labium; 2 mature larvæ in thorax. *b*, 4 mature larvæ in labia of 2 specimens.
13	.....	2	2 mature larvæ in labium of each specimen.
15	.....	4	*a*, 4 mature larvæ in labia of 2 specimens. *b*, 2 specimens negative.

TABLE 1.—*Data from dissections of Culex quinquefasciatus Say infected with Dirofilaria immitis Leidy*—Continued.

EXPERIMENT 6; 26 MOSQUITOES, FED SEPTEMBER 4, 1935.

Mosquitoes dissected.			Results of dissections and remarks.
Days after feeding.	Died.	Killed.	
1		2	Both negative.
2		1	Negative.
4		1	Do.
5		1	1 premature larva (sausage-shaped) in Malpighian tubules.
8	1	2	a, 6 premature larvæ in Malpighian tubules of 2 specimens. b, 3 premature larvæ in Malpighian tubules of 2 specimens.
9		2	6 premature larvæ in Malpighian tubules.
10		1	3 premature larvæ in Malpighian tubules.
11	1	3	a, 4 mature larvæ in labia of 2 specimens. b, 2 specimens negative.
12		3	Each with 2 mature larvæ in Malpighian tubules.
13		2	a, 4 mature larvæ in labium. b, 1 mature larva in labium.
14	1	3	a, 2 mature larvæ in labia of 2 specimens. b, 2 specimens negative.
15		2	a, 1 mature larva in labium. b, 1 specimen negative.

EXPERIMENT 7; 19 MOSQUITOES, FED SEPTEMBER 6, 1935.

3		2	Both positive in Malpighian tubules.
4		1	Negative.
5		1	6 premature larvæ (sausage-shaped) in Malpighian tubules.
6	1	2	a, 4 premature larvæ (sausage-shaped) in Malpighian tubules of 2 specimens. b, 1 specimen negative.
7		2	a, 3 premature larvæ in Malpighian tubules. b, 5 premature larvæ in Malpighian tubules.
8		1	Negative.
10		1	7 premature larvæ in Malpighian tubules.
11		2	a, 2 mature larvæ in labium. b, 2 mature larvæ in thorax.
12		2	a, 3 mature larvæ in labium. b, 1 mature larva in labium.
13		1	4 mature larvæ in labium.
15		2	a, 2 mature larvæ in labium. b, 1 negative.
16		1	1 mature larva in labium.

TABLE 2.—*Data from dissections of Stegomyia fasciata (Aëdes aegypti Linnæus) infected with Dirofilaria immitis Leidy.*

Mosquitoes dissected.			Results of dissections and remarks.
Days after feeding.	Died.	Killed.	
EXPERIMENT 8; 18 MOSQUITOES, FED SEPTEMBER 7, 1935.			
2	.... ..	2	Both positive in Malpighian tubules; 2 immature in 1 specimen.
4	.....	1	Positive in Malpighian tubules (sausage-shaped) with tail; 5 premature larvæ.
7	.....	1	Positive in Malpighian tubules (advanced sausage-shaped).
10	1	6	a, 4 mature larvæ in the heads of 2 specimens. b, 6 mature larvæ in the heads of 2 specimens. c, 1 specimen negative.
12	.....	1	Negative.
14	.....	1	4 mature larvæ in the thorax; 2 mature larvæ in the head; 11 mature larvæ in the labium.
16	....	2	Both negative (Malpighian tubules not disintegrated).
EXPERIMENT 9; 12 MOSQUITOES, FED SEPTEMBER 8, 1935.			
10	2	1	a, Negative. b, Positive in Malpighian tubules (premature larvæ not counted). c, 4 mature larvæ in Malpighian tubules (active in normal salt solution).
15	.....	3	a, 2 mature larvæ in labium of 1 specimen. b, 4 mature larvæ in labia of 2 specimens.
16	.....	4	a, 4 mature larvæ in thorax; 2 in head. b, 4 mature larvæ in head; 6 in labium. c, 4 mature larvæ in labium. d, 2 mature larvæ in labium.
17	.....	2	Both negative (Malpighian tubules not disintegrated).
EXPERIMENT 10; 28 MOSQUITOES, FED SEPTEMBER 9, 1935.			
3	1	.....	Positive in Malpighian tubules (sausage-shaped).
4	.....	2	6 premature larvæ in Malpighian tubules of each specimen.
5	.....	2	Both negative.
6	2	2	a, 4 premature larvæ in Malpighian tubules. b, 7 premature larvæ in Malpighian tubules. c, 2 negative.
7	.....	1	5 premature larvæ (advanced sausage-shaped) in Malpighian tubules.
8	.....	1	Negative.
9	.....	2	Both positive; many premature larvæ in Malpighian tubules; not counted.
10	.....	1	4 premature larvæ in Malpighian tubules.
11	1	1	a, 4 premature larvæ in Malpighian tubules. b, 1 specimen negative.
12	.....	2	a, 2 mature larvæ in head. b, 6 mature larvæ in labium.
13	2	2	a, 2 mature larvæ in heads of 2 specimens. b, 3 mature larvæ in head; 2 mature larvæ in labium.
14	.....	1	2 mature larvæ in labium.
15	1	2	a, 4 mature larvæ in labium; 2 mature larvæ in heads of 2 specimens. b, 1 specimen negative.
16	.....	1	Negative (Malpighian tubules not disintegrated).
17	.....	2	Negative in thorax, head, and labium; Malpighian tubules disintegrated.

TABLE 2.—*Data from dissections of Stegomyia fasciata (Aëdes aegypti Linnæus) infected with Dirofilaria immitis Leidy*—Continued.

EXPERIMENT 11; 18 MOSQUITOES, FED SEPTEMBER 10, 1935.

Mosquitoes dissected.			Results of dissections and remarks.
Days after feeding.	Dead.	Killed.	
1	.....	2	Both positive in Malpighian tubules.
3	.....	1	4 premature larvæ in Malpighian tubules.
4	1	1	*a*, 4 premature larvæ in Malpighian tubules. *b*, 1 specimen negative.
6	.....	2	Both negative.
8	.....	2	Positive in Malpighian tubules in both specimens (calcified).
10	1	1	*a*, 6 premature larvæ (advanced sausage-shaped) in Malpighian tubules. *b*, Negative.
11	.....	1	1 mature larva in thorax; 2 mature larvæ in head.
12	.....	2	*a*, 2 mature larvæ in labium. *b*, 4 mature larvæ in labium.
13	.....	1	4 mature larvæ in head.
14	.....	2	*a*, 1 mature larva in thorax. *b*, 3 mature larvæ in head.
15	.....	1	4 mature larvæ in labium.

EXPERIMENT 12; 12 MOSQUITOES, FED SEPTEMBER 11, 1935.

3	1	2	*a*, Positive in Malpighian tubules of 2 specimens (calcified). *b*, 1 specimen negative.
4	.....	2	Both positive in Malpighian tubules; larvæ not counted.
6	1	3	*a*, 6, 4, and 9 premature larvæ, respectively, in Malpighian tubules of 3 specimens. *b*, 1 specimen negative.
7	2	3	*a*, Positive in Malpighian tubules of 3 specimens; many larvæ (sausage-shaped) not counted. *b*, 2 specimens negative.
9	.....	2	Both positive in Malpighian tubules (calcified).
10	1	2	*a*, 5 premature larvæ (about to escape) in Malpighian tubules of 1 specimen. *b*, As in *a* but with 7 premature larvæ. *c*, 1 specimen negative.
11	1	1	*a*, 2 mature larvæ in head; 2 mature larvæ in thorax. *b*, 1 specimen negative.
13	.....	1	4 mature larvæ in head.
14	.....	2	2 mature larvæ in head of each specimen.
15	.....	1	4 mature larvæ in head.

ILLUSTRATION

[Photographs by the Department of Agriculture and Commerce.]

PLATE 1

FIG. 1. *Dirofilaria immitis* Leidy, premature larvæ, in a small portion of the Malpighian tubules of *Culex quinquefasciatus* Say.

2. *Dirofilaria immitis* Leidy, mature larvæ, in the proboscis of *Culex quinquefasciatus* Say.

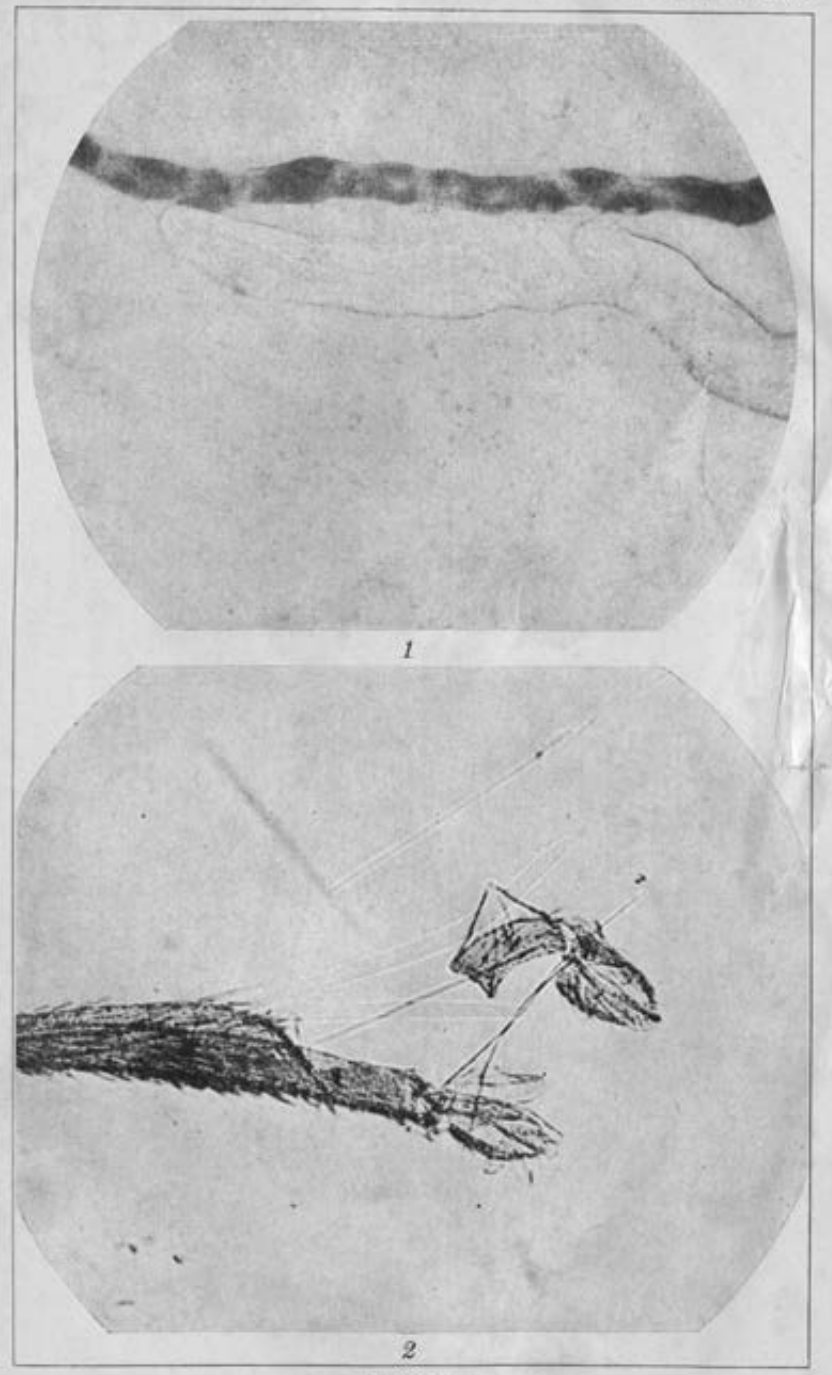

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PLATE 1.

SCOLYTIDÆ AND PLATYPODIDÆ: FAUNA PHILIPPINENSIS, IV [1]

By KARL E. SCHEDL

Of the Institut für angewandte Zoologie, Munich, Germany

FIVE TEXT FIGURES

PITYOPHTHORUS PHILIPPINENSIS sp. nov.

Reddish brown, 1.8 mm long, 2.6 times as long as wide. A species which most probably (after the other sex is found) has to be placed in the fourth group of Blackman's key. The first species of the genus recorded from the Philippine Islands.

Front plano-convex, very densely and finely punctured, with a fine, elevated median carina. Antennal club long oval, widest through the second segment, with the two septate sutures well developed.

Pronotum as wide as long, widest in the basal third, base distinctly bisinuate, posterolateral angles rounded, sides arcuate and convergent in the basal half, thence strongly constricted, rather narrowly rounded in front; anterior margin armed with several subequal, low asperities, anterior area steep and asperate, asperities scattered, not fused at their base, posterior area densely and coarsely punctured, transverse depression distinct, median line impunctate and feebly elevated. Scutellum large, shining.

Elytra as wide and nearly twice as long as the pronotum, sides parallel on the anterior two-thirds, broadly rounded behind; cylindrical disc shining, punctured in distinct rows, the first ones impressed, interspaces wide, finely reticulate, with small scattered punctures; declivity commencing far behind the middle, convex, suture narrowly elevated and with a row of fine granules, second interspace wide, broadly impressed, shining, subimpunctate, lateral convexities lower than the suture and also with a few small setose granules.

Type in my collection.

LUZON, Manila, 1908 (*Raszlag*).

[1] Thirty-seventh contribution to the systematics of the Scolytidæ and Platypodidæ of the world.

CRYPTOXYLEBORUS EGGERSI sp. nov.

Female.—Reddish brown, 4.5 mm long, 3.1 times as long as wide. Similar to *C. turbineus* Samps. but larger, the elytra with a transverse depression about in the middle and more coarsely sculptured.

Front plano-convex, subshining, minutely areolate, coarsely punctured, median carina long and fine, extending to the upper margin of the eyes.

Pronotum longer than wide (17 : 15), widest before the middle, base broadly arcuate, posterolateral angles strongly rounded, sides straight, somewhat divergent towards the anterior third, apex very broadly rounded, summit far in front of the middle, anterior area moderately convex, finely asperate, posterior portion shining, rather densely and finely punctured, entire surface with yellow pubescence.

Elytra at the base distinctly narrower (15 : 14) and 1.4 times as long as the pronotum, humeral angles rectangular, rather strongly rounded, sides straight but convergent up to the posterior third, then angulate and drawn out into a slender process at the apex; cylindrical, with a transverse depression at about the middle, the declivity oblique and similar to that of *C. turbineus* Samps.; disc densely and rather confusedly punctured, the first and second striæ impressed, the punctures not quite in distinct regular rows, the first interstice very narrow throughout, the second with a row of shining, backwardly directed tubercles, which commence at the anterior third of the elytra and continue to the apex, largest at the summit of the declivity, the third interstice with a similar row but more weakly developed, the remaining interstices with small tubercles on the declivity, at the apex on the first and second interstices with a larger, slender, toothlike tubercle, those of the first interstice being longer; the interstices of the entire elytra shining, with long yellow pubescence, on the declivity the first and second striæ rather distinctly punctured and impressed.

Types in the collections of Eggers and Schedl.

MINDANAO, Kolambugan, January 25, 1915 (*Böttcher*).

Genus PSEUDOXYLEBORUS Eggers

Examining the type, *Pseudoxyleborus beesoni* Egg., I find some facts that make it necessary to revise the generic diagnosis. The species of the genus *Xyleborus* that hitherto have been regarded as rather closely related and have been grouped around *Xyleborus truncatus* Er. show striking differences if the antenna

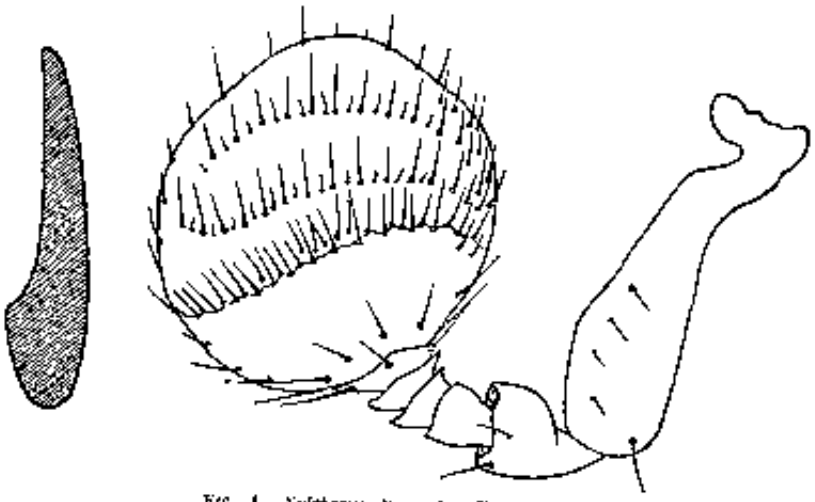

FIG. 1. *Xyleborus truncatus* Er., antenna.

is carefully studied. *Xyleborus truncatus* Er. (fig. 1) and *X. striatotruncatus* Schedl have the antennal club moderately compressed, very obliquely truncate, and with two widely separated sutures; *X. monacus* Blandf. (fig. 2) and *X. abruptus* Samps.

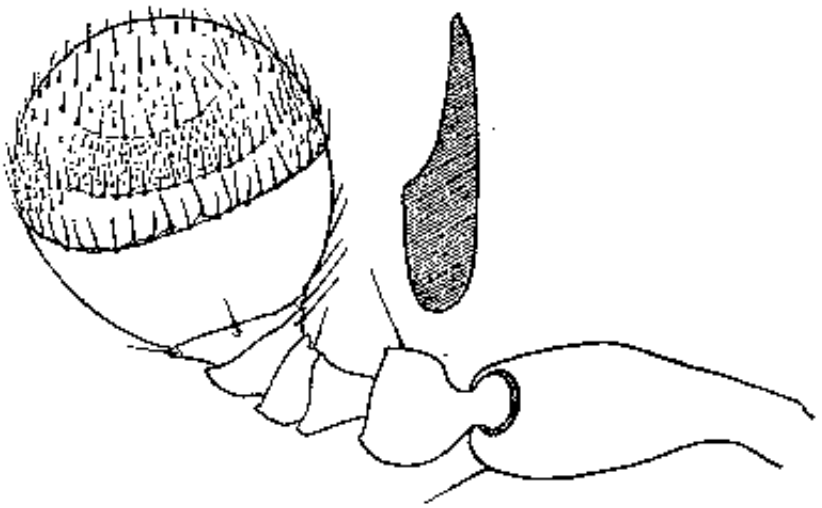

FIG. 2. *Xyleborus monacus* Blandford, antenna.

have the club less compressed, steeply, and obliquely truncate, and the suture near the wide basal piece. It is quite likely that the examination of more species of this group will bring to light intermediate forms so that they finally cannot be separated by

the antennæ alone. More striking differences are shown by *Pseudoxyleborus beesoni* (fig. 3) and some allied species.

The antennal funicle is not 4-jointed as stated by Eggers, but has five segments like all Xyleborinæ. The pedicle is large, the second segment about as long as wide, the others gradually increasing in width; the club subcircular, strongly compressed, more strongly so distally, without visible sutures, the external face densely covered with short pubescence. The eyes are either entirely separated into two parts or connected by a single row of facets or a simple suture only. Of the species examined the following belong to this genus: *Xyleborus nobilis* Egg., *X. aspersus* Samps., *X. opalescens* Schedl, and *X. corthyloides* Schedl. Doubtless many more of the described species will have to be referred to this genus, the validity of which I regard as beyond question.

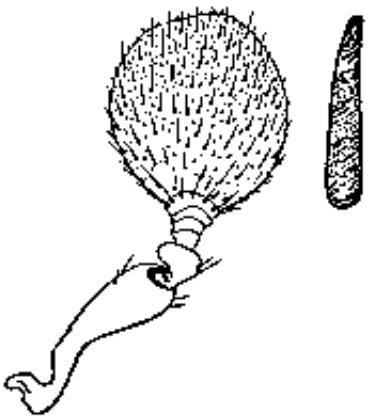

FIG. 3. *Pseudoxyleborus beesoni* Egg., Antenna of the type.

GENERA WEBBIA HOPKINS AND XYLEBORICUS EGGERS

For a time I had doubts concerning the relationship of *Webbia* Hopk. and *Xyleboricus* Egg. Lately Mr. Eggers kindly placed his entire material at my disposition, and after examining it I am in a position to give some revisional notes. The antenna, the main character for distinguishing the two genera, has been examined in the following species: *Xyleboricus talanticus* Egg., *X. mediosectus* Egg., *X. canaliculatus* Egg., *X. pusillus* Egg., *Webbia pabo* Samps., *W. 18-spinatus* Samps., *W. sublævis* Egg., *W. medius* Egg., *W. imitator* Egg., *W. platypoides* Egg., *W. confinis* Egg., *W. mucronatus* Egg., *W. minor* Egg., *W. marginatus* Egg., and *W. nitidus* Egg.

Genus WEBBIA Hopkins

Female.—Body elongate, cylindrical, resembling certain species of the Platypodidæ, head concealed by the long cylindrical, anteriorly feebly convex pronotum, eyes oblong, elliptical, emarginate in front, antenna (fig. 4) with the funicle 4-jointed, the club from circular to short oval in outline, with an obliquely

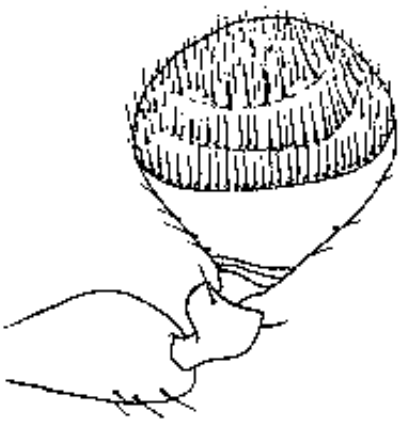

FIG. 4. *Webbia platypoides* Egg., antenna.

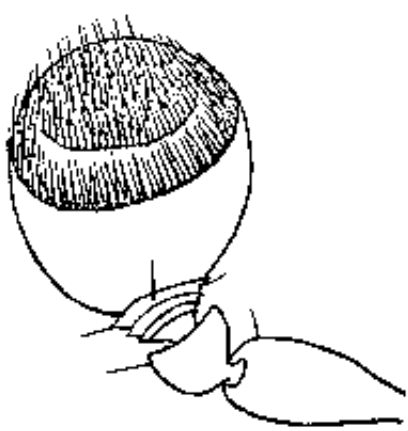

FIG. 5. *Xyleboricus confinis* Eggers, antenna.

truncate face, the basal and the internal face strongly chitinized, the oblique truncate face with two more or less distinct sutures, usually formed by rows of closely placed setæ; anterior tibiæ strongly narrowed distally, with a submarginal row of small, densely placed teeth on the ventral side; elytra cylindrical, usually with remarkable declivital armature.

Male.—As far as known smaller than the female, probably of similar relative characters as in the genus *Xyleborus*.

From the general shape of the body it can be concluded that all members of the genus are true ambrosia feeders. Besides the type, *Webbia dipterocarpus* Hopk., I refer the following species to this genus: *Webbia pabo* Samps., *W. 18-spinatus* Samps., *W. 30-spinatus* Samps. (antennæ not examined), *W. 26-spinatus* Samps. (as before), *W. platypoides* Egg., *W. mucronatus* Egg., *W. dentatus* Egg. (antennæ not examined), and *W. talautiens* Egg.

Genus XYLEBORICUS Eggers

Body short cylindrical to oval in outline, head concealed by the pronotum, eyes long oval, strongly emarginate in front, antennæ with the funicle 5-jointed (not 2-jointed as is stated in the original description), club subcircular in outline, obliquely truncate as in *Webbia* Hopk., sutures more or less distinct on the oblique face, anterior tibiæ very feebly widened at the middle, narrowed distally, outer edge with a row of submarginal teeth; pronotum with the summit far in front of the middle, moderately convex, cylindrical behind, more so than in the genus *Xyleborus;* elytra cylindrical, declivity convex, in the majority

of the species with the interstices narrowly carinate and finely tuberculate.

The species described are apparently all females; the type of the genus is *Xyleboricus canaliculatus* Egg.

The value of the genus and its relationship to the large genus *Xyleborus* are rather difficult to interpret at present. The few specimens available do not allow dissection and examination of the mouth parts, proventriculus, and genitalia. The following species have to be referred to this genus: *Xyleboricus mediosectus* Egg., *X. orbiculatus* Egg., *X. malayensis* Schedl, *X. dissimilis* Egg., *X. similis* Egg. (I did not have an opportunity to examine the antennæ of the last two species), *Webbia medius* Egg., *W. imitator* Egg., *W. minor* Egg., *W. marginatus* Egg., *W. confinis* Egg., *W. sublævis* Egg., *W. tuberculatus* Egg., and *W. pusillus* Egg.

Webbia nitidus Egg. has been misplaced also. It has the antennal funicle 5-jointed, the club circular, strongly compressed, not obliquely truncate, and without noteworthy sutures. I shall give more information in another paper.

XYLEBORUS MARGINICOLLIS sp. nov.

Female.—Reddish brown, 1.4 mm long, 2.1 times as long as wide. This small species has to be placed in the neighborhood of *X. quadrispinosulus* Egg., with which it coincides in the general shape; distinguishing characters are the lack of tubercles on the declivity and the sculpture of the pronotum.

Front convex, shining, polished and sparsely but coarsely punctured below; subshining and finely and densely punctulate above, along the median line feebly elevated. Eyes short oval, emarginate in front. Pronotum wider than long (23:18), widest near the base, the latter transverse, posterolateral angles rounded, sides strongly arcuate and convergent from the base to the moderately rounded apex, anterior margin armed with several asperities, the median two feebly longer, surface strongly globose, summit at the middle, anterior area steep, covered with asperities, posterior area shining, very sparsely and finely punctured.

Elytra but little wider and 1.5 times as long as the pronotum, sides subparallel, feebly arcuate, broadly and somewhat angulately rounded behind, ascending and convex on the basal third, obliquely rounded, rather strongly flattened on the declivity; disc shining, with hardly noticeable rows of fine punctures, interspaces wide and subimpunctate; the punctures coarser, the striæ

distinct and the suture feebly elevated on the flattened declivity, the apical margin acute.

Type in my collection.

LUZON.

XYLEBORUS LIMATUS sp. nov.

Female.—Reddish brown, 1.7 mm long, nearly three times as long as wide. Related to *X. lævis* Egg. but much smaller and with other sculpture.

Front convex, shining, sparsely and coarsely punctured, especially on the sides, towards the eyes. Eyes short oval, shallowly emarginate in front.

Pronotum longer than wide (23 : 20), base transverse, posterolateral angles rounded, sides parallel on more than the basal half, thence feebly constricted, broadly rounded in front, summit before the middle, anterior area finely asperate, feebly convex, basal area shining, with scattered fine punctures. Scutellum small, triangular.

Elytra as wide and 1.5 times as long as the pronotum, sides parallel, broadly rounded behind, shallowly and triangularly emarginate at the suture; cylindrical on the basal half, gradually and obliquely convex on the declivity; disc shining, punctured in distinct rows, punctures small, rather remotely placed, interspaces somewhat reticulate, with smaller, scattered punctures; declivity with the suture and the third interstice elevated and with a row of setose granules, first and second striæ with coarse punctures and feebly impressed, second interstice very narrow, irregularly and densely punctured laterad to the third interstice, apical margin very acute, minutely serrate, the entire declivity appearing subopaque.

Type in my collection.

LUZON, Laguna Province, Mount Maquiling, July 29, 1932 (*F. C. Hadden*).

PLATYPUS EXCEDENS Chap.

Female.—Reddish brown, 3.2 mm long, 3.6 times as long as wide.

Front shining and concave below, subshining, flattened and densely and finely areolate above, the concavity with a strongly elevated but narrow median carina in the upper half, surface peculiarly areolate-wrinkled. Antennæ inserted just below the eyes, articulation very distant from that of the mandibles, antennal scape strongly flattened, compressed, much wider than

long, broadly oval in outline. Vertex separated from the front by a subacute angle.

Pronotum longer than wide (10 : 8.5), femoral grooves hardly visible from above, median sulcus very long, feebly developed, surrounded by a cordiform patch of fine, densely placed punctures on its anterior half, the anterior limits of this patch usually surrounded by a more or less distinct line, surface shining, sparingly punctured.

Elytra about as wide and nearly twice as long as the pronotum, sides parallel, conjointly and broadly rounded behind; disc punctured in fine rather regular rows, somewhat impressed towards the base, interstices subshining, with fine scattered punctures, base of the second to fourth with fine, densely placed tubercles; declivity moderately convex, commencing in the apical fourth, finely granulate, with short yellow pubescence.

This is the first description of the female. Types in Mr. Hadden's collection and in my own.

LUZON, Laguna Province, Mount Maquiling, July 26, 1932 (*F. C. Hadden*).

DIAPUS PLUMATUS sp. nov.

Female.—Yellowish brown, 3.2 mm long, nearly three times as long as wide. This species is well characterized by the sculpture of the front and pronotum.

Front subshining, long, subrostrate below, with a triangular, shining, elevated ridge extending from the articulation of the mandibles to the center, the inclosed area ornamented with a plush of very long (twice as long as the head when viewed from above), slender, forward directed hairs, articulation of the antennæ in the middle of the front, narrowed and situated between the eyes, antennal scape slender and feebly club-shaped, genæ subimpunctate, posterior half of the front (above the insertion of the antennæ) minutely punctured, rounded towards the vertex, the latter long and opaque, with a transverse row of coarse punctures anteriorly, the median line narrowly elevated and shining.

Pronotum polished, longer than wide (11 : 9), widest at the posterior angles of the femoral grooves, much narrower anteriorly to the latter, median sulcus indicated as a fine dark line, with three large pores on each side of its anterior extremity, surface subimpunctate. External face of the anterior tibiæ with numerous, fine, transverse rugosities.

Elytra as wide and 1.6 times as long as the pronotum, sides parallel, each elytron somewhat separately rounded posteriorly,

rather flat as a whole, with hardly visible rows of punctures, the first three interstices feebly elevated near the base, declivity feebly developed, hardly convex, with few long hairs; abdomen convex, ascending.

Type in my collection.

Philippines; as I received it from Mr. Hadden, it likely was collected in Luzon.

DIAPUS MULTIPORUS sp. nov.

Female.—Head and pronotum fuscous, elytra yellow, apex darker, 5.6 mm long (without the projecting abdomen), four times as long as wide. A remarkable species.

Front flat, with a broad, medially divided plush of long, curled reddish hairs arising from the epistomal margin and a similar inward curled fringe on the sides on the inner margin of the eyes, the ends of the latter meet in the center, the high flat area between those plushes, as far as can be seen, polished; eyes in the upper half of front, articulation of antennæ on the upper inner edges of the eyes, remaining portion of front plano-convex, rounded towards the vertex, the latter with rather long, subshining, elevated median line.

Prontum longer than wide (15 : 13), femoral grooves shallow, base strongly bisinuate, median sulcus indicated as a long dark line, on most of its length accompanied on both sides by a wide subquadrate area which is densely covered with medium-sized pores, remaining surface subshining, subimpunctate, along the apical border with a row of coarse punctures.

Elytra feebly wider than and 1.6 times as long as the pronotum, sides parallel, posteriorly hardly convex, each elytron feebly and separately rounded, strial punctures hardly noticeable, feebly impressed, interstices feebly convex near the suture and base, subimpunctate. Abdomen projecting far beyond the elytra, the spiracles on the last segment very large, the last sternite nearly as long as the others together.

Type in my collection.

Philippine Islands, from alcoholic material.

ILLUSTRATIONS

TEXT FIGURES

FIG. 1. *Xyleborus truncatus* Er., antenna.
2. *Xylechorus mancus* Blandford, antenna.
3. *Pseudoxylechorus beesoni* Egg., antenna of the type.
4. *Webbia platypoides* Egg., antenna.
5. *Xyleborieus confinis* Egg., antenna.

CHIRONOMIDÆ FROM JAPAN (DIPTERA), VII

NEW SPECIES AND A NEW VARIETY OF THE GENUS CHIRONOMUS MEIGEN [1]

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FOUR PLATES

The chironomid flies reported in the present paper were collected entirely at Seto, Wakayama Prefecture, Japan, near the Marine Biological Station of the Kyoto Imperial University. Some of them were reared from the larvæ in the laboratory. There have been reported, so far as known, the following six salt-water dwelling species of the genus *Chironomus* (sen. str.): *Chironomus halophilus* Kieffer, *bicornutus* Kieffer, *salinarius* Kieffer, *halochares* Kieffer, *aprilinus* Meigen, and *barbipes* Staeger. To these I am adding two new species and one new variety.

I am greatly indebted to Prof. Dr. Hachiro Yuasa and Prof. Dr. Yô K. Okada for their kind help in this study.

CHIRONOMUS (CHIRONOMUS) ENTEROMORPHÆ sp. nov.

This species is very common ashore at Seto. The specimens examined were reared from the larvæ collected at the tide pools where the green alga *Enteromorpha intestinalis* was luxuriant.

According to the taxonomic system of Edwards (1929) this species obviously belongs to series 2 of group B of the subgenus *Chironomus*, possessing pubescent dorsal appendages. All other known salt-water species of *Chironomus* belong to series 1, being provided with bare chitinized dorsal appendages.

In the pupal stage the apical teeth or spines of the eighth abdominal segment have been regarded as one of the most important taxonomic characters, being comparatively constant in structure for the species; however, it is noteworthy that they show wide variation in the present species, as shown in the figures (Plate 1, figs. 2 to 5).

[1] Contributions from the entomological laboratory, Kyoto Imperial University, No. 51. Contribution from the Seto Marine Biological Laboratory, Kyoto Imperial University.

Male.—Body slender, length about 3.5 to 4 mm; thorax yellowish brown, with brown dorsal stripes; abdomen brown.

Eyes not widely separated above, with long dorsal projections around the antennal bases; distance between them on the dorsal side subequal to that of the ventral side, the ratio being 9 : 22 to the vertical length of the eyes; dorsal apex of vertex with a conspicuous V-shaped incision in the frontal aspect; frontal tubercles distinct; antennæ 12-segmented, antennal ratio about 1 (20 : 19); maxillary palpi distinctly 4-segmented (3: 5: 8: 12); clypeus setigerous with brown setæ.

Pronotum narrow, with a small median incision; scutum with three rows of small setæ; supra-alar setal group represented by six to eight small setæ; humeral pits obscure; scutellum setigerous, pale brown; postscutellum black, with a T-shaped yellow stripe.

Abdomen yellowish brown, without specially colored bands; hypopygium (Plate 1, fig. 1) pale brown; ultimate tergum very scantily haired with several setæ on its meson and with small setæ on the caudal margin; anal point well developed, chitinized, bare, not trilobate apically; coxite with five to seven slender setæ on its ventromesal margin; style slender, with several stiff setæ on its apex and about ten small, slender setæ on the distal half of its fleshy dorsal ridge; dorsal appendage short but broad, not beyond the tip of the coxite, entirely pubescent, with two to four apical setæ and a bare chitinized hook, which is ventrally curved; ventral appendage large, straight, far beyond the middle of the style, fully reaching the tip of the anal point, provided with many, strong, curved setæ on its distal part.

Legs yellowish brown; coxæ reddish brown; femur, tibia, and ultimate segment of tarsus somewhat darker; foreleg without trace of tibial spur and comb; leg ratio about 1.6 to 1.7; middle and hind tibiæ each provided with two distinct confluent combs, which occupy about four-fifths of the circumference of the tibial tip; each comb with a short spur; claws slender, simple; empodium slender; pulvilli well developed, padlike, as long as the claws themselves.

Wings about 2.5 mm long, hyaline, very slightly ochraceous under transmitted light, without colored marks on the membrane; main veins brown; r-m very short, oblique, not obviously darkened; R_{2+3} ending on costa a little beyond the end of R_1; fCu slightly beyond r-m; 1A beyond fCu; R and R_1 setigerous. Haltere yellow.

Female.—Body subequal in length to that of the male; abdomen and wings broader than in the male, but subequal in length to those of the male; coloration as in the male. Apical incision of the vertex not so deep as in the male; relative lengths of the four segments of the maxillary palpus 3 : 6 : 10 : 14; antennæ 6-segmented (4 : 6 : 4 : 4 : 4 : 10); ultimate segment elongated, with a small apical seta; second segment somewhat elongated, slightly constricted at middle; following three segments short, fusiform, without distinct neck regions. Leg ratio about 1.5 to 1.7. Ultimate sternum broad, setigerous, with a U-shaped caudal incision, with a median, shallow, longitudinal furrow, without special long setæ on its margin; cerci short, small, rhombic; cercaria (small lunate sclerite at the articulation of the cercus) with two small setæ; spermathecæ two, hyaline, oval. Wings setigerous on veins R, R_1, and R_{4+5}.

Other characters of the head, thorax, legs, wings, and abdomen closely similar to those of the male.

Pupa.—Body about 5 to 6 mm long, female slightly larger than male; exuviæ hyaline, ochraceous; genital sheaths of female smaller than those of male, located under ultimate segment, not visible from dorsal aspect, those of male large, extending beyond ultimate segment.

Sheaths of frontal tubercles large, almost straight, not curved ventrad, with a simple seta and three minute chitinized projections on each tip; antennal sheath ending in a specially thickened thornlike tip. Prothoracic respiratory appendages grouped in two bunches at base. Abdomen (Plate 1, fig. 6) scantily setigerous; dorsum typically with two pairs of setæ on meson and three setæ on either lateral part; venter with one pair of setæ on caudomeson and four setæ on either lateral part; latus typically with four setæ; these lateral setæ on cephalic four segments small, ordinary in shape, usually less in number, being one to four, while those on caudal segments are very long and flattened; caudal four segments, from fifth to eighth, with lateral, lamellalike, chitinized expansions; dorsum of the abdominal segments from second to sixth finely spinulose with minute spinules (Plate 1, fig. 8); dorsocaudal margin of second abdominal segment provided with a comblike structure, consisting of a single row of hooklike spinules (Plate 1, fig. 7); laterocaudal corners of fourth sternum with spinulose patches (Plate 1, fig. 9); apex of lateral margin of eighth segment with small yellow teeth, which vary widely in number (2 to 6) and shape (isolated or united), as shown in Plate 1, figs. 2 to 5; lateral, fanlike, chiti-

nized expansions of ultimate segment ordinary in structure, being fringed with hyaline, flattened, swimming hairs; each lateral half of these expansions with more hairs (53 to 58) in the female than in the male (38 to 40), and in both sexes provided with an isolated brown seta; dorsum of nonspinulose segments showing fine reticulation.

Larva.—Body blood red in life, 9 to 10 mm long in full-grown specimens, without lateral gill filaments on caudal segments; anal gills greatly reduced as in the halobiotic species of *Chironomus* in general.

Head capsule reddish brown, smooth in general appearance; antennæ slightly shorter than mandibles, 5-segmented (30 : 6 : 4 : 4 : 2), with a minute sensory pore on proximal part of first segment; trichoid sensillæ two on antenna: A long large one, which is equally bifurcate and subequal in length to second and third segments taken together, on distal end of first segment, and a small one, which is simple and subequal in length to third segment itself, on distal end of second segment; clypeal region consisting of a large preclypeal sclerite and lateral membranous parts, provided with three pairs of large tuberculate setæ as in the Chironominæ in general; labrum membranous, with many various appendages as shown in Plate 2, fig. 15; of these appendages the mesal three pairs provided with their independent chitinized basal rings, ventromesal comblike pair hyaline and triangular; labralia with a hyaline seta near articulation of premandible; epigusta with paired bunches of serrate hooks inside the U-shaped sclerite and a strongly chitinized comblike plate, which is distinctly serrate into eight or eleven teeth just caudad of paired comblike plates of the labrum; unpaired, small, chitinized plate located just caudad of the U-shaped sclerite; premandibles (Plate 2, fig. 16) comparatively slender, tridentate; membrane near the base of premandible swollen and densely spinose.

Mandibles comparatively slender, distinctly serrate into four stout dark, cutting teeth and one slender, brown, distal tooth; proximal brustia consisting of tufts of hyaline branched filaments; distal brustia consisting of comparatively long setæ arranged in a single row; one isolated hyaline seta, which is short, hardly reaching tip of most proximal tooth located on cutting edge; maxillæ (Plate 1, fig. 12) supported by well-developed chitinized plate on ventral side; two very long setæ on meson of this broad ventral plate; both cardo and stipes comparatively well developed; inner lobe of maxilla (lacinia) large, membra-

nous, provided with various sensory organs and brown thornlike and fingerlike projections on its distal margin; outer lobe of maxilla small, with two sensory setæ and comparatively large maxillary palpus; maxillary palpus provided with many sensillæ on its distal end and a small sensory pit on the ventrodistal part; segmentation of the maxillary palpus obscure, probably 3-segmented including the ultimate, minute, conical structure; mentum with thirteen teeth as shown in Plate 2, fig. 13; unpaired median tooth largest, not sharply pointed; innermost paired teeth large, extending as far as median tooth, also not sharply pointed; next lateral pair small, smaller than following lateral pair, sometimes appearing as a blunt shoulder of innermost pair; other pairs of lateral teeth more or less pointed, gradually decreasing in size laterad; lateral fanlike lamellæ of mentum comparatively small, somewhat triangular, finely striated radially; one long isolated seta near the base of this fanlike lamella; hypopharyngeal projection (Plate 2, fig. 14) membranous, with thornlike appendages and scalelike hyaline projections on its margin; common salivary duct very short; accessory chitinized endoskeletons as shown in fig. 14.

Setæ of body, excepting the caudal tufts, slender and weakly developed; anterior pseudopods well developed, provided with numerous, golden yellow, thornlike spinules on fleshy bilobate projections; those spinules on distal part long, slender, very finely serrate only on tip, while the great majority of spinules on other parts are short, stout, and finely serrate on the distal half; united proximal part and dorsocephalic surface of anterior pseudopods without spinules and setæ, being quite smooth; posterior pseudopods well developed, long, each crowned with fifteen yellowish brown thornlike hooks, which are radially arranged in three rows: Six on outer proximal, five on middle, and four on inner distal semicircular row (Plate 1, figs. 10 and 11); paired caudal tufts situated close to each other; each tuft consisting of eight, long, slender setæ and two, small, tuberculate setæ on each basal papilla.

Habitat.—*Enteromorpha* tide pool, upper tidal zone, Japan.

Holotype.—Male; Seto, Wakayama Prefecture; June 27, 1930.

Allotopotype.—Female; Seto, Kakayama Prefecture; June 27, 1930.

Paratopotypes.—Males and females; Seto, Wakayama Prefecture; June 27, 1930.

Type specimens.—Alcoholic; deposited in the entomological laboratory, Kyoto Imperial University; collected by M. Tokunaga.

This species resembles *Ch. longipes* Staeger and *Ch. dissidens* Walker in the structures of the hypopygium, but distinctly differs from each of the related species in the structure of the dorsal appendages of the hypopygium, in the coloration of the wing veins, and in the different value of the leg ratio.

CHIRONOMUS (CHIRONOMUS) ENTEROMORPHÆ var. PACIFICUS var. nov.

This variety was reared from the larvæ found in rock tide pools at the upper tidal line at Seto.

Male.—Body about 6 mm long, ground color brown.

Frontal tubercles small; eyes very narrowly separated from each other on the dorsal side; distance between them about two-sevenths as great as the vertical length of the eyes themselves; antennæ 12-segmented; antennal ratio about 1.1; maxillary palpi 4-segmented (3 : 5 : 10 : 12). Thorax with three brown scutal vittæ, of which the median one is subdivided by a pale median line; sternal side of the mesosternepisternum brown; pleural side with three brown spots near the wing base; scutellum pale brown, setigerous, brown only on its lateral margins; postscutellum brown, with a T-shaped pale pattern. Abdomen uniformly brown. Hypopygium (Plate 3, fig. 22) setigerous, similar in structure to that of *Chironomus enteromorphæ* Tokunaga, but slightly differing in the following points: Ultimate tergite more setigerous, dorsal appendages longer, ventral appendages with two or three almost straight setæ in addition to strong recurved setæ on tip, and styles broader. Leg ratio about 1.5; proportional lengths of the five tarsal segments of forelegs 60 : 30 : 25 : 19 : 10. Wings with pale brown crossvein; fCu under r-m. Halteres yellow.

Habitat.—Salt water; Japan.

Holotype.—Male; Seto, Wakayama Prefecture; April 23, 1928.

Paratopotypes.—Males; head, forelegs, and hypopygium mounted in euparal; April 23, 1928.

Type specimens.—Alcoholic; deposited in the entomological laboratory of Kyoto Imperial University; collected by Prof. Dr. H. Yuasa.

This variety is closely allied to the type form, from which it slightly differs in the structure of the hypopygium, in the wing venation, in the proportional lengths of the segments of the maxillary palpi, and in the value of the leg ratio.

CHIRONOMUS (CHIRONOMUS) KIIENSIS sp. nov.

This species is commonly found at Seto and females are often captured at light ashore in summer.

Male.—Body slender, ground color yellow, about 5 mm long.

Frontal tubercles present, small; antennæ 12-segmented, brown; second antennal segment yellow, but its distal end brown; antennal ratio about 3.2 to 3.3; maxillary palpi distinctly 4-segmented (3 : 7 : 7 : 11); last maxillary palpal segment yellow; frontoclypeus with many long brown setæ.

Scutum with distinct reddish brown vittæ; median vitta with a longitudinal, pale, median line; pale posterior region of the scutum with a fine, dark, median line; scutellum yellow, setigerous, its lateral margins brown; sternal side of the mesosternepisternum reddish brown; mesonotepisternum, mesonotepimeron, and mesosternepimeron each with a reddish brown spot near base of wing articulation; supra-alar setal group represented by five to seven small setæ.

Abdomen slender, yellowish; first tergum with two pairs of brown stripes: mesal pair small and lateral pair long and oblique; second to fourth terga each with a median I-shaped brown stripe; following three terga entirely brown, stripes being obscure, each with a brown V-shaped chitinization on its meson. Hypopygium (Plate 3, fig. 23) brown, setigerous; ultimate tergum with a small, oval, setigerous plate and V-shaped chitinization on meson; its caudal setæ near basis of anal point slender; anal point strongly chitinized, bare, curved ventrad, not trilobed apically; coxites slightly constricted, each with five slender setæ on its ventromesal ridge; styles distinctly narrowed on apical one-third, each provided with six, small, strong setæ on apex and about thirteen, small, slender setæ on ventral ridge of style; dorsal appendages large and slender, not extending to tip of anal point, bare, strongly curved ventrad, each with a few setæ on its basal pubescent area; ventral appendages large and straight, extending far beyond middle of styles, provided with many, strong, recurved setæ and a few slender setæ on apical one-third.

Legs yellow in ground color; coxæ and trochanters brown; femora each with a distinct brown ring just before distal tip; two distal segments and distal ends of three proximal segments of each tarsus reddish brown; forelegs without tibial spurs; each tibia of the middle and hind legs provided with two basally fused combs, which occupy about three-fourths the circumference of tibial end; two tibial combs each provided with a small spur; fore tarsal segments have the following proportional lengths: 80 : 45 : 30 : 24 : 12; leg ratio 1.7 to 1.8; claws simple; empodium slender, setigerous; pulvilli large, padlike, setigerous, extended distad far beyond middle of claws.

Wings slightly clouded; two elongated nebulæ in cell R_5, a narrow nebula in cell M_2 along vein M_{1+2}, narrow nebulæ along veins M_{3+4}, Cu_1, 1A, and 2A; r-m distinctly darkened; fCu beyond the crossvein; R_{2+3} extended closely along R_1, ending slightly distad of the end of R_1; Cu_1 and 1A slightly sinuous on distal parts; R, R_1, and R_{5+4} brown, setigerous. Halteres yellow.

Female.—Body about 3 to 5 mm long; coloration similar to that of the male; abdomen entirely pale brown, sometimes with paired, pale yellow, longitudinal stripes through the terga from the second to seventh segments. Antennæ 6-segmented (4 : 7 : 6 : 6 : 6 : 10); intermediate segments each with a distinct neck region; ultimate segment brown, with one apical seta; maxillary palpi 4-segmented (2 : 8 : 10 : 11 or 2 : 6 : 8 : 12). Leg ratio 1.8 to 1.9; proportional lengths of the fore tarsal segments 90 : 45 : 35 : 32 : 15. Hypopygium (Plate 4, fig. 29) brown; ultimate sternum slightly dark, subdivided into paired setigerous plates by the median shallow furrow, with a shallow, U-shaped, caudal incision; octavalvæ bilobate; lateral lobe fleshy, very small, spinulose with minute spinules; cerci comparatively large, discoidal, not angulate or pointed caudad; spermathecæ two, comparatively large, almost spherical.

Habitat.—Fresh water (?); Japan.

Holotype.—Male; hypopygium and fore tarsus mounted in euparal; Seto, Wakayama Prefecture; June 24, 1930.

Allotopotype.—Female; June 24, 1930.

Paratopotypes.—Females; hypopygium mounted in euparal; June 21 and 26, 1930.

Type specimens.—Alcoholic; deposited in the entomological laboratory of Kyoto Imperial University; collected by M. Tokunaga.

This species is distinctly characteristic in the possession of the nebulose wings, and, except for this character, closely related to certain Sumatran species, *Ch. javanus* Johannsen and *Ch. costatus* Johannsen, from which it differs in the coloration of the thorax and legs and in the proportional lengths of the third and fourth tarsal segments of the forelegs.

CHIRONOMUS (CHIRONOMUS) SETONIS sp. nov.

This species is very common at the seashore, and the type specimens were reared from larvæ found in salt pools at Shirarahama and in rock tide pools at Seto. These pools are usually found near the high-tide mark and the water in them varies

from fresh to saturated salt water in different topographic and climatic conditions.

Male.—Body about 5 mm long, slender, ground color yellow. Head pale brown, including mouth parts and first segments of antennæ; distance between eyes on vertex very small; frontal tubercles minute, antennæ 12-segmented, brown; antennal ratio about 8; maxillary palpi distinctly 4-segmented (3 : 10 : 10 : 16).

Thorax yellow, with a yellow median vitta and two, brownish yellow, lateral vittæ; postscutellum also brownish yellow; supra-alar setal group represented by five dark setæ.

Abdomen yellow, with yellowish white setæ; each tergum from the second to seventh with a brown spot on meson, these spots of the anterior three segments larger than those of the other caudal segments. Hypopygium (Plate 3, fig. 24) pale brown; ultimate tergum brown, with a U-shaped chitinization on meson, setigerous on caudal region; anal point well developed, thickened, curved ventrad; coxites each with four or five slender setæ on its ventromesal edge; styles slender, tapering on the distal half, each with seven stiff setæ on the dorsal side of its tip, about thirteen small setæ on the ventral side of its entire length; dorsal appendages bare, thickly chitinized, strongly curved ventrad, especially thickened on its lateral edges; ventral appendages almost straight, extending just before the middle of the styles and not reaching the tip of the anal point, provided with many strongly curved setæ on tip.

Legs, including coxæ, yellow; distal tip of each tarsal segment slightly brown; proportional lengths of the five tarsal segments of foreleg 82 : 45 : 40 : 35 : 17; leg ratio 1.5 to 1.6; forelegs not bearded, without tibial spurs; middle and hind tibiæ each with two spurs and usual large combs; claws slender, simple; empodium slender, setigerous, extending as far as the tips of the claws; pulvilli large, padlike, as long as the claws themselves.

Wings hyaline; crossvein brown; fCu just beyond r-m; R, R_1, and R_{4+5} brown, setigerous; R_{2+3} closely extended along vein R_1, ending near the tip of R_1. Halteres yellowish brown.

Female.—Body about 4 mm long; coloration generally subequal to that of the male, but different in the paler lateral vittæ of the scutum, yellow halteres, and more obscure dorsal spots of abdominal segments.

Maxillary palpi 4-segmented (2 : 10 : 10 : 17); antennæ pale brown, 6-segmented (4 : 8 : 6 : 7 : 6 : 10); distal segment with an apical seta; intermediate segments each with a distinct neck

region. Hypopygium closely resembling that of the preceding species, *Ch. kiiensis*, only different in the more setigerous sternum and more spinulose octavalvæ; spermathecæ (Plate 2, fig. 20) two, more elongated than in related species, very slightly brown on neck region. Forelegs show the following proportional lengths of tarsal segments: 90:48:43:43:18; leg ratio 1.6 to 1.7; pulvilli far larger than in the male. Other structures of the female closely identical with those of the male.

Pupa.—Body 7 to 8 mm long; exuviæ brown, with lateral chitinizations on the abdominal segments.

Sheaths of frontal tubercles prominent, curved ventrocaudad, each with a simple preapical seta, ended in a sharp point. Prothoracic respiratory organs consisting of numerous white filaments. First abdominal segment not spinulose; other abdominal segments, from second to eighth, more or less spinulose on dorsal side with minute spinules; spinulose area of second to sixth segments broad; that of the seventh small, separated by a median bare area into lateral halves; that of the penultimate segment also paired but broader than that of the preceding segment; marginal ridge of second abdominal tergum consisting of a single row of small chitinized hooklets; these hooklets (Plate 2, fig. 19) sharply pointed; fourth segment with a pair of spinulose blunt tubercles on laterocaudal corners of venter; penultimate segment provided with a pair of large black spines; these spines (Plate 2, figs. 17 and 18) usually double in structure and sometimes single; caudal, finlike, swimming expansions of the ultimate segment large, dark brown, deeply incised at caudomeson; each lateral half of the caudal expansion provided with about sixty-five long swimming hairs and a single isolated seta on its margin. Caudal incision of the swimming expansion larger and deeper in female than in male; genital sheaths of male large, elongate, extending beyond caudal margin of swimming expansion, those of female small, spherical, not extending beyond expansion.

Habitat.—Salt water; Japan.

Holotype.—Male; hypopygium mounted in euparal; Shirarahama, Wakayama Prefecture; June 17, 1930.

Allotopotype.—Female; June 17, 1930.

Paratopotype.—Female; hypopygium mounted in euparal; June 17, 1930.

Type specimens.—Alcoholic; deposited in the entomological laboratory of Kyoto Imperial University; collected and reared by M. Tokunaga.

The coloration, the values of the leg ratio and the antennal ratio, and the structures of the hypopygium of the present species are closely related to those of *Chironomus javanus* Johannsen, but the proportional lengths of the third and fourth tarsal segments of the forelegs are distinctly different. Another related species may be *Chironomus quadratus* Johannsen, but it is distinguishable by the different coloration of the thorax.

CHIRONOMUS (CHIRONOMUS) BASITIBIALIS sp. nov.

This species is very common at Seto, Wakayama Prefecture, being frequently captured at light ashore and, in the daytime, often found resting on the walls of the shore caves.

Male.—Body about 5 mm long; ground color yellowish brown. Head brown, including mouth parts and antennæ; eyes very narrowly separated from each other on the dorsal side; frontal tubercles small; antennæ 12-segmented; antennal ratio about 3.6; maxillary palpi 4-segmented (2 : 9 : 11 : 17).

Thoracic coloration resembling that of *Chironomus kiiensis* Tokunaga; three dorsal vittæ reddish brown; caudal margin of median vitta and cephalic margins of lateral vittæ narrowly dark brown, thus the scutum with six dark stripes; ventral side of mesosternepisternum reddish brown; pleural side with brown patterns near the base of the wing as in *Ch. kiiensis*; supra-alar setal group represented by six small setæ.

Abdominal coloration closely resembling that of *Ch. setonis* Tokunaga, having a more or less brown spot on each tergum from the second to seventh segments. Hypopygium (Plate 3, fig. 25) brown, setigerous; anal point well developed, curved ventrad; coxites each with six setæ on its ventromesal edge; styles slender, tapering on the distal half, each with six stiff setæ on its tip and twelve slender setæ on its ventral side; dorsal appendages large, bare; ventral appendages almost straight, with curved strong setæ on the tip.

Coloration of legs characteristic; coxæ, trochanters, and last tarsal segments of all legs entirely brown, femora and basal halves of fore tibiæ brown, proximal one-half or one-third of each middle and hind femur brown, four proximal tarsal segments brown only on distal ends; other parts of legs yellow; leg ratio about 1.62; proportional lengths of fore tarsal segments 86 : 49 : 42 : 36 : 18. Combs and spurs of middle and hind tibiæ large; spurs and beards of foreleg wanting; empodium slender, setigerous, as long as the claws; pulvilli large, padlike in structure, setigerous, extended hardly as far as the tips of the claws.

Wings hyaline; crossvein slightly brown; fCu under r-m; R_1, R_1, and R_{1+2} slightly brown, setigerous; R_{2+3} extending closely along R_1, ending just beyond the tip of R_1. Halteres white.

Female.—Body 4 to 4.5 mm long; coloration as in male, but different in the browner abdominal terga and pale brown antennæ.

Head with minute frontal tubercles; antennæ 6-segmented (3 : 8 : 5 : 6 : 5 : 12); ultimate segments usually subequal in length to the preceding two segments taken together, but sometimes reduced in length and showing the ratio 3 : 8 : 6 : 7 : 6 : 11, provided with a small preapical seta and usually without apical setæ; intermediate antennal segments each with a distinct neck region. Usually median vitta of scutum more distinctly separated by a median pale line than in the male. Dorsal side of abdominal segments brown; each tergum with a narrow yellow band on caudal margin; coloration of ultimate segments dark brown. Hypopygium brown, setigerous; ultimate sternum setigerous, with a U-shaped caudal incision; lateral lobe of the octavalva spinose with minute inwardly grown spinules; cerci yellow, somewhat angulate; ventrobasal lobes of the cerci well developed, distinctly angulate; spermathecæ (Plate 2, fig. 21) two, large, oval, and hyaline. Coloration of legs similar to that of the male; usually the proximal part of the fore tibia distinctly darker than in male; sometimes brown femur of foreleg darkened on its distal tip. Other structures of the head, thorax, abdomen, wings, and legs are closely similar to those of the male.

Habitat.—Fresh water (?); Japan.

Holotype.—Male; hypopygium mounted in euparal; Seto, Wakayama Prefecture; August 31, 1930.

Allotopotype.—Female; August 21, 1927.

Paratopotypes.—Females; head and hypopygium mounted in euparal; August 20 and 21, 1927, June 26 and August 31, 1930.

Type specimens.—Alcoholic; deposited in the entomological laboratory of Kyoto Imperial University; collected by M. Tokunaga.

This species is closely allied to *Chironomus rhyparobius* Kieffer and *Ch. palpalis* Johannsen, but it differs from the former related fly in the values of the leg ratio and the antennal ratio; from the latter species it differs in the shorter distance between the eyes, which is about one-sixth or one-seventh of the head width, and in the slenderer dorsal appendages of the male hypopygium.

CHIRONOMUS (POLYPEDILUM) OCTOGUTTATUS sp. nov.

This species is very commonly found at the Seto Marine Biological Station in summer and often captured at a light screen ashore.

Male.—Body entirely dark brown, about 4.5 mm long.

Distance between the eyes on the dorsal side very short, about one-third of the vertical length of the eyes themselves; antennæ 14-segmented; antennal ratio about 2.5; maxillary palpi distinctly 4-segmented (2 : 5 : 7 : 10); labellum brown; frontoclypeus setigerous with long brown setæ; frontal tubercles wanting.

Thorax without distinct vittæ, with dark median line on the scutum; pronotum very narrow; scutellum yellowish brown, setigerous with many small setæ; postscutellum dark brown.

Abdomen slender, setigerous in general appearance, dark brown on the dorsum; last two sterna dark brown, setigerous; hypopygium (Plate 4, fig. 27) setigerous; ultimate tergum with an oval setigerous thickening on its meson, highly setigerous on its caudal margin; anal point long, distinctly thickened; coxites constricted before the styles; styles setigerous, broad, with small setæ on mesal ridges of distal region; dorsal appendages of hypopygium slender, bare, chitinized, slightly curved, extending caudad beyond tip of anal point; ventral appendages stout, pubescent, straight, slightly swollen on the apex, each with a long straight seta and many strongly curved setæ on distal swollen part.

Legs brown in ground color; coxæ dark brown; femora dark brown; leg ratio 1.5 to 1.6; tibial combs of middle and hind legs consisting of two basally fused spinules which occupy about two-thirds of the circumference of the tibial tip; small comb with a small spur and large comb without trace of spur; claws simple; empodium slender, setigerous, as long as the claws themselves; pulvilli large, padlike, setigerous, as long as empodium.

Wings (Plate 4, fig. 26) hyaline, with eight nebulose dark patterns; three dark nebulæ in cell R_5, two in cell M_2, one in M_4, one between veins 1A and 2A; veins R, R_1, and R_{4+5} setigerous, brown; r-m short, brown; R_{2+3} ending slightly beyond end of R_1; fCu beyond the crossvein. Haltere yellow.

Female.—Body 2.5 to 3 mm long; coloration similar to that of the male. Antennæ 6-segmented (3 : 6 : 4 : 5 : 5 : 8); ultimate segment dark brown, with two long apical setæ; intermediate segments each with a short but distinct neck region; maxillary palpi 4-segmented (3 : 5 : 7 : 12); ultimate segment

comparatively longer than in male. Wing pattern similar to that of male, but sometimes an additional nebula located in the distomarginal area of cell M_2, in such a case cell M_2 with three nebulæ. Hypopygium (Plate 4, fig. 28) especially dark brown, setigerous; ultimate sternum broad, with a large U-shaped incision on its caudomesal margin; cerci short, angulate, rhombic; octavalvæ bilobate into a large, broad, median lobe and a slender, fingerlike, lateral lobe, as shown in fig. 28; spermathecæ two, hyaline, spherical. Other structures of the head, thorax, abdomen, wings, and legs closely resemble those of the opposite sex.

Habitat.—Fresh water (?); Japan.

Holotype.—Male; Seto, Wakayama Prefecture; June 21, 1930.

Allotopotype.—Female; June 21, 1930.

Paratopotypes.—Females; hypopygium mounted in euparal; June 21, 1930.

Type specimens.—Alcoholic; deposited in the entomological laboratory of Kyoto Imperial University; collected by M. Tokunaga.

This species closely resembles *Chironomus* (*Polypedilum*) *emarginatus* Kieffer and *Ch.* (*P.*) *nubiculosus* Meigen, but is distinctly different in the possession of many nebulæ on the wings and pale halteres and also distinguishable by the different values of the leg ratio and the antennal ratio.

ILLUSTRATIONS

PLATE 1

FIGS. 1 to 12. *Chironomus* (*Chironomus*) *enteromorphæ* sp. nov.; *1*, male hypopygium, dorsal aspect, with dorsal appendage; *2* to *5*, pupal spines of penultimate segment, showing variation; *6*, pupal abdomen from second to seventh segments, dorsal aspect; *7*, hooklike spine of caudal comblike edge of second abdominal segment of pupa; *8*, various dorsal spinules of pupal abdomen; *9*, pupal spinulose patch of fourth abdominal sternum; *10*, various hooklets of posterior pseudopod of larva; *11*, various hooklets of anterior pseudopod of larva; *12*, larval maxilla, ventral aspect.

PLATE 2

FIGS. 13 to 16. *Chironomus* (*Chironomus*) *enteromorphæ* sp. nov.; *13*, larval mentum, ventral aspect; *14*, larval hypopharynx, dorsal aspect; *15*, larval labroepigusta, cephalic aspect; *16*, larval premandible, lateral aspect.

17 to 20. *Chironomus* (*Chironomus*) *setonis* sp. nov.; *17* and *18*, pupal spines of penultimate segment, showing variation; *19*, pupal hooklike spine of caudal comblike edge of second abdominal segment; *20*, female spermatheca.

FIG. 21. *Chironomus* (*Chironomus*) *basitibialis* sp. nov.; female spermatheca.

PLATE 3

FIG. 22. *Chironomus* (*Chironomus*) *enteromorphæ* var. *pacificus* var. nov., male hypopygium, dorsal aspect.

23. *Chironomus* (*Chironomus*) *kilcnsis* sp. nov., male hypopygium, dorsal aspect.

24. *Chironomus* (*Chironomus*) *setonis* sp. nov., male hypopygium, dorsal aspect.

25. *Chironomus* (*Chironomus*) *basitibialis* sp. nov., male hypopygium, dorsal aspect.

PLATE 4

FIGS. 26 to 28. *Chironomus* (*Polypedilum*) *octoguttatus* sp. nov.; *26*, male wing; *27*, male hypopygium, dorsal aspect; *28*, female ultimate sternum, with spermatheca and valval lobes, ventral aspect.

FIG. 29. *Chironomus* (*Chironomus*) *kilcnsis* sp. nov., female ultimate sternum, with spermatheca and valval lobes, ventral aspect.

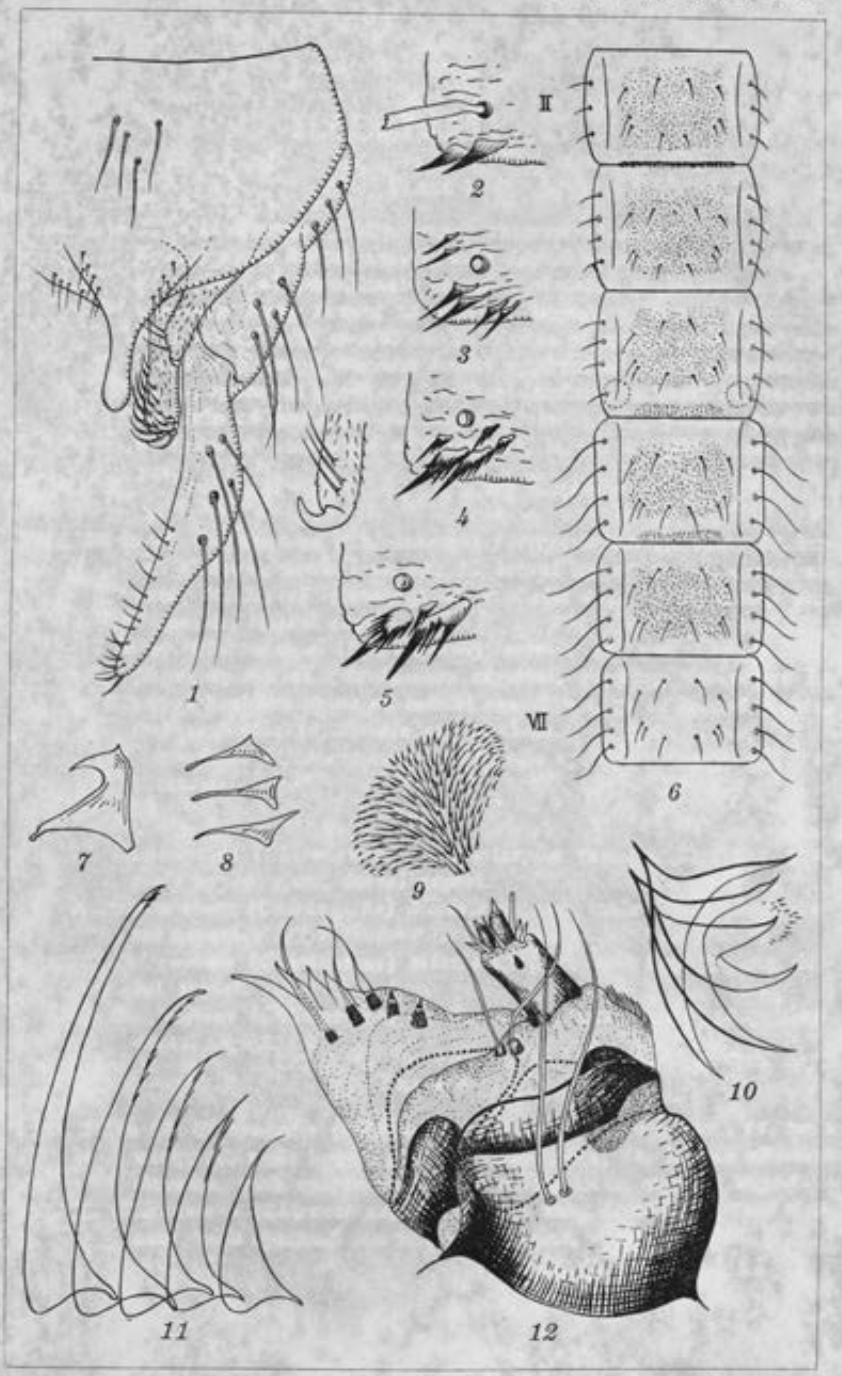
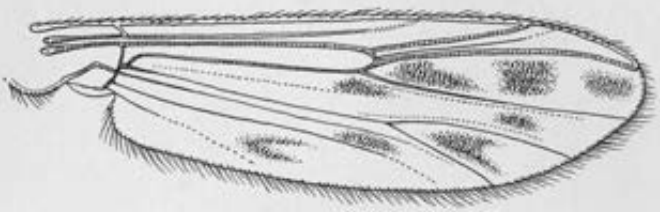


PLATE 1.



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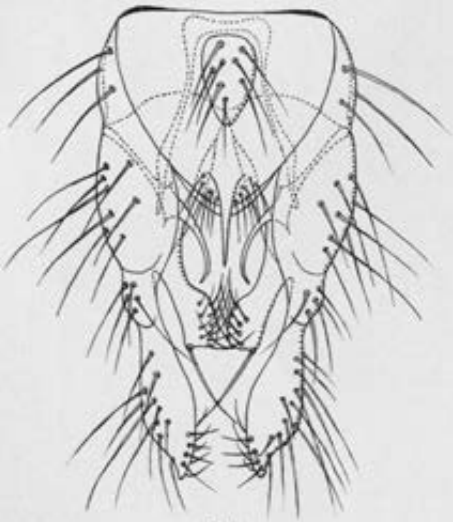

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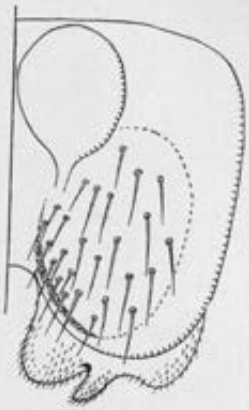

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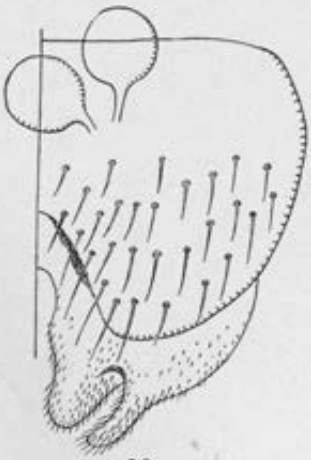

28

PLATE 2.

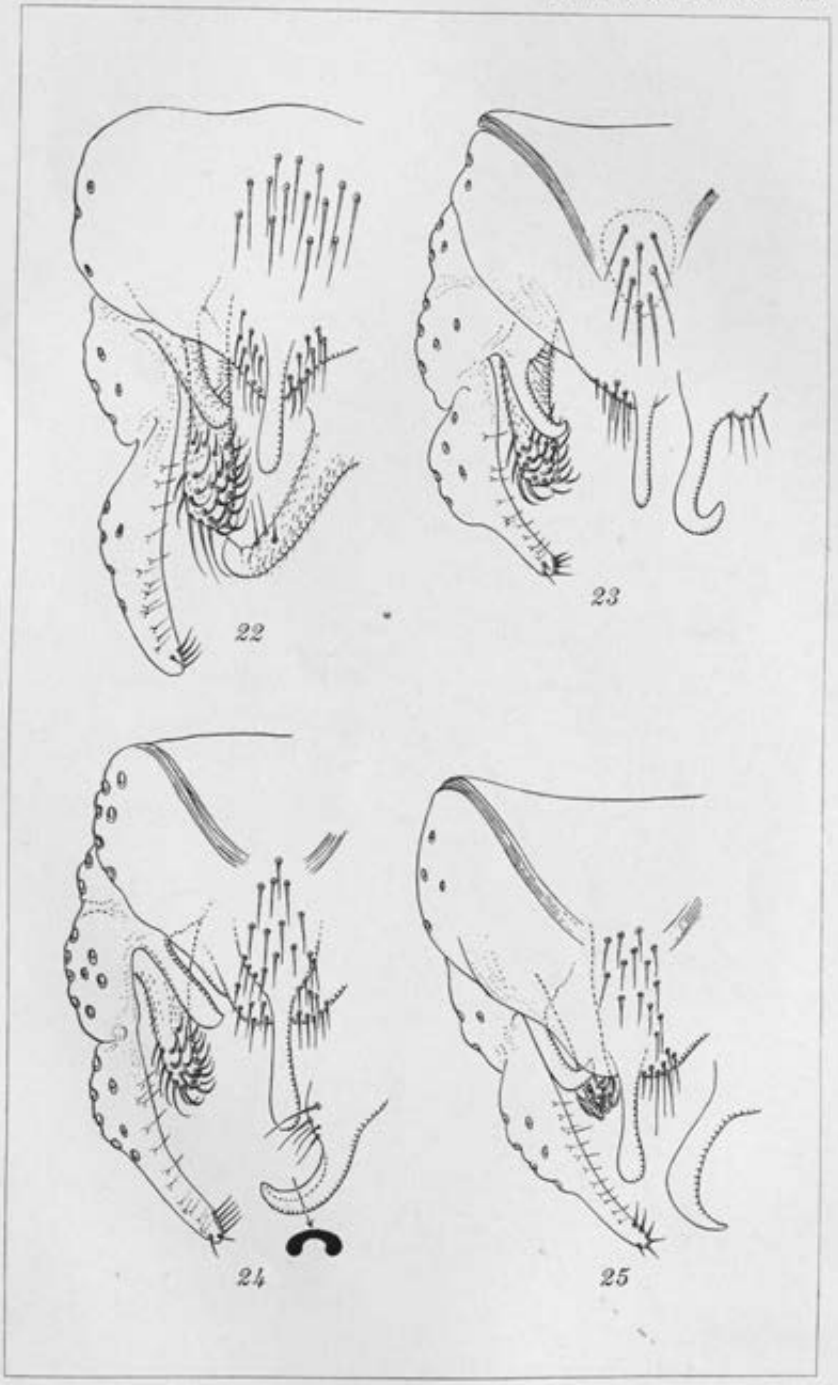

PLATE 3.

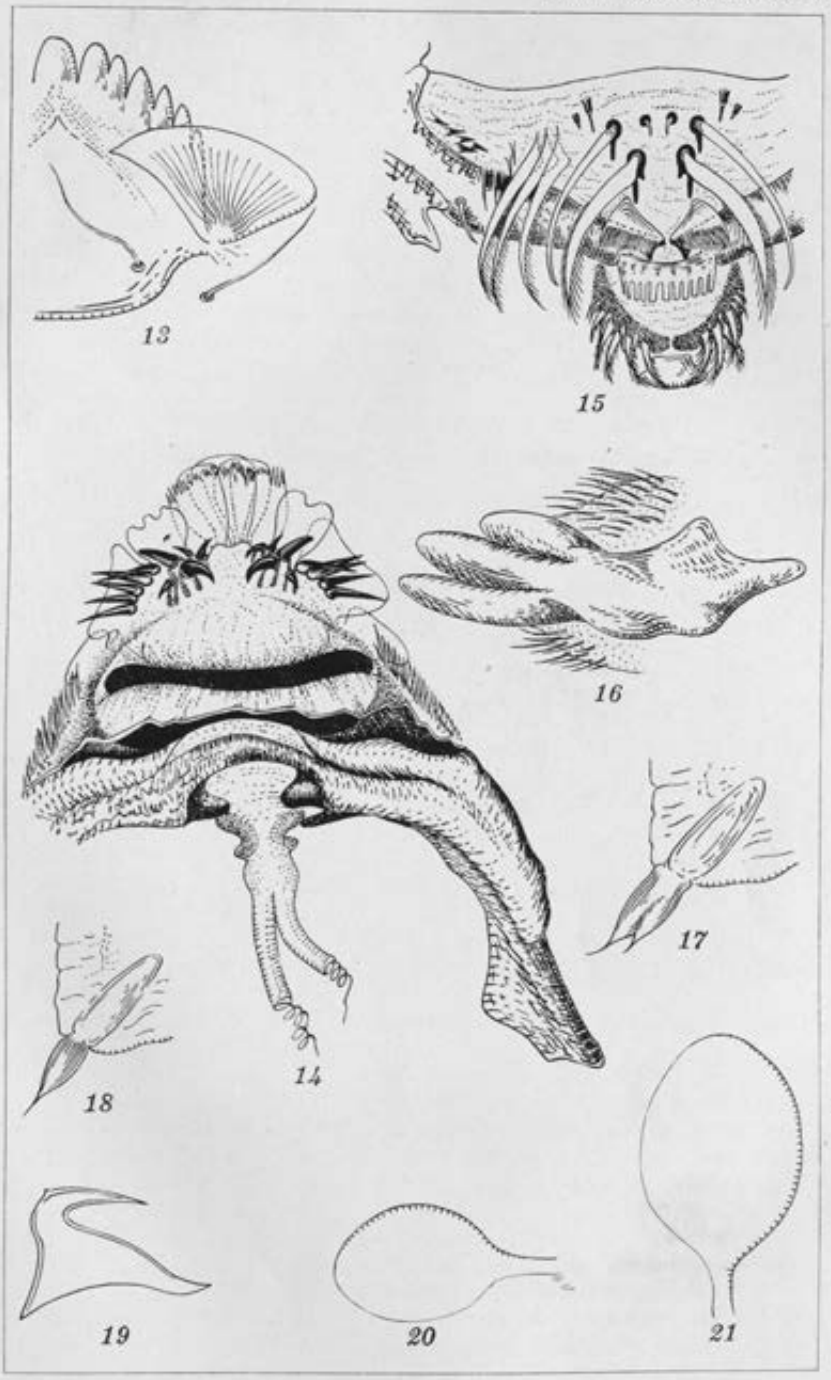

PLATE 4.

BOOKS

Acknowledgment of all books received by the Philippine Journal of Science will be made in this column, from which a selection will be made for review.

RECEIVED

BROWN, SANGER, and HOWARD W. POTTER. The psychiatric study of problem children. Utica, N. Y., State hospitals press, 1930. 152 pp.

Central coöperative anti-malaria society. Annual report. Calcutta, 15th, 1935. 59 pp.

DAVIDOFF, LEO M. Brain tumors; their pathology, symptomatology, diagnosis and prognosis. Utica, N. Y., State hospitals press, 1931. 158 pp.

FERNANDEZ, JOSÉ M. M. Impresiones acerca del estado de la lepra en Estados Unidos de Norte America, Hawaii, Filipinas, Japon, India y Brasil. Rosario, Editorial medica Lagos, 1935. 173 pp.

FORTUNE, R. F. Manus religion; an ethnological study of the Manus natives of the Admiralty Islands. Philadelphia, American philosophical society, 1935. 391 pp.

HUTCHINS, RICHARD HENRY. A psychiatric word book, a lexicon of terms employed in psychiatry and psychoanalysis designed for students of medicine and nursing and psychiatric social workers. 4th ed. Utica, N. Y., State hospitals press, 1935. 212 pp.

KÜHN, B. C. R. Die bergbaukunst nach dem vortrag. [n.d.] 3 pts.

LIDDELL, DONALD M., and GILBERT E. DOAN. The principles of metallurgy. New York and London, McGraw-Hill book co., 1933. 626 pp.

LUNDHOLM, HELGE. Conation and our conscious life; protegomena to a doctrine of urge psychology. Durham, N. C., Duke university press, 1934. 95 pp.

MALZBERG, BENJAMIN. Mortality among patients with mental disease. Utica, N. Y., State hospitals press, 1934. 234 pp.

Onchocerciasis with special reference to the central American form of the disease. Cambridge, Harvard university press, 1934. 234 pp.

Pacific science congress, 5th, Victoria and Vancouver, Canada, 1933. Proceedings of the fifth Pacific science congress, held under the auspices of the National research council of Canada. Canada, University of Toronto press, 1933. 5v.

PASCHER, A. Die süsswasserflora mitteleuropas, bearb. von prof. dr. G. Beck Mannagetta, J. Brunthaler, dr. V. Czurda, herausgegeben von prof. dr. A. Pascher. 2. aufl. Jena, G. Fischer, 1913–1932. 7 v.

PINTO, CESAR. Profilaxia das doeças infecciosas e parasitarias dos animais domesticos do Brasil. Rio de Janeiro, Ministerio da agricultura, Brasil, 1933.

RAMAN KUTTY MENON, S. The coconut industry of Travancore. Quilon, S. R. V. press, 1933. 189 pp.

REID, WILLIAM DUNCAN. Teaching methods in medicine; the application of the philosophy of contemporary education to medical schools. Newton, Mass., The Graphic press. 11 pp.

Texas. University. Bureau of research in the social sciences. Study. no. 3. 1931.

VECHT, JACOBUS VAN DER. De groote peperwants of somoenjoeng (Dasynus piperis China). Leiden, N. V. Boek-en steendrukkerij, E. Ijdo, 1933. (Proefschrift Ph. D., Leiden. Rijksuniversiteit, 1933.) 95 pp.

WEBER, GUSTAVUS ADOLPHUS. The Bureau of entomology; its history, activities and organization. Washington, The Brookings institutions, 1930. 177 pp.

WILE, FREDERIC WILLIAM. Emile Berliner; maker of the microphone. Indianapolis, Bobbs-Merrill co., 1926. 353 pp.

MARCH 9, 1936

American bureau of metal statistics. Year book. N. Y., 5th, 1934, 112 pp. tables. Price, $2.

American society for testing materials. Committee A–5 on corrosion of iron and steel. Report. Philadelphia, Pa., 1935. 31 pp. fold. tables. Price, $0.50.

American society for testing materials. Committee D–2 on petroleum products and lubricants. A. S. T. M. standards on petroleum products and lubricants. Philadelphia, Pa., 1935. 358 pp. illus., tables, diagrs. Price, $1.75.

American society for testing materials. Committee D–11 on rubber products. A. S. T. M. standards on rubber products. Philadelphia, Pa., 1935. 201 pp. illus., tables, diagrs.

American society for testing materials. Committee D–14 on screen wire cloth. Report. Philadelphia, Pa., 1935. 20 pp. illus., tables, diagrs. Price, $0.35.

BARD, LILIAN. Daily what to "eats"; is a book of master menus with recipes easily found and followed. It's purpose—meal time made easy, dedicated to ladies of America distributed through their associations and organizations. Lancaster, Pa., The Author. [c. 1933.] 48 pp. port.

BRETT, T. J. Engineer-custodians manual; examination questions and answers for engineers, custodians, firemen, building superintendent, etc., including boilers and combustion, engines, heating and ventilating, air conditioning, pumps, sanitation and plumbing, electrical machinery, mechanics, technical formulas, tables, and general information. Chicago, American technical society, 1934. 184 pp. Price, $2.50.

Canning, W., & co., pub. The Canning practical handbook on electroplating, polishing, bronzing, lacquering and enamelling. 12th ed. Birmingham, London & Sheffield, W. Canning & co., 1934. 344 pp. front., illus., tables, diagrs. Price, $2.

Carnegie institution of Washington. Elihu Root lectures of Carnegie institution of Washington on the influence of science and research on current thought. Washington, 1933. v+54 pp.

CORBET, ALEXANDER STEVEN. Biological processes in tropical soils with special reference to Malaysia. Cambridge, W. Heffer & sons, [1935] xiv+156 pp., front., tables, diagrs., plates. Price, $2.

DEGLER, HOWARD EDWARD. Diesel and other internal-combustion engines; a practical text on the development, principles of operation, construction, details and performance of stationary and portable diesel, gas, and gasoline engines. Chicago, American technical society, 1935. 237 pp. front., illus., tables, diagrs. Price, $2.50.

DYKE, ANDREW LEE. Dyke's automobile and gasoline engine encyclopedia; the elementary principles, construction, operation and repair of automobiles, gasoline engines and automobile electric systems; including trucks, tractors, motor-coaches and motorcycles; simple, thorough and practical. 7th. ed. Chicago, The Goodheart-Willcox co., 1935. xxxvi +1249 pp. illus. tables. Price, $6.

Edwenil; a lysinogenic agent for the control of endotoxic infections. Walford, England, R. Samuel & co., [n. d.] 12 pp. diagrs.

FITZPATRICK, FREDERICK LINDER. Biology for public school administrators. N. Y. City, Teachers college, Columbia university, 1934. vi+87 pp. Price, $1.25.

Fundamentals of dairy science, by associates of Lore A. Rogers. 2d ed. N. Y., Reinhold publishing corp., 1935. 616 pp. front., illus., tables, diagrs. Price, $6.

GERSHENFELD, LOUIS. The Jew in science. Philadelphia, Pa., The Jewish publication society of America [c. 1934]. vii+224 pp. Price, $2.75.

HORN, PAUL VALENTINE. International trade principles and practices. N. Y., Prentice-Hall, 1935. xxiv+723 pp. tables, diagrs., forms. Price, $5.

HYLANDER, CLARENCE JOHN. American scientists. N. Y., Macmillan, 1935. xiii+186 pp. front., ports. Price, $2.

International veterinary congress, N. Y. International veterinary congress. 1934. 12th, 3 v. illus., tables, diagrs.

KNAPP-FISHER, HUBERT CLINTON. The world of nature, with an introduction by E. W. MacBride and illustrations of more than 500 forms of life by Joan Harrison. London, V. Gollancz, 1935. 512 pp. illus. Price, $1.50.

KOFOID, CHARLES A. Termites and termite control. [ed. by] Charles A. Kofoid, S. F. Light, A. C. Horner, and others. 2d ed. rev. Berkeley, University of California press., 1934. xxvii+795 pp. front., illus., diagrs., tables. Price, $5.

Liverpool biological society. Proceedings and transactions. University press of Liverpool, 1935. vol. 84, xi+98 pp. tables, diagrs. Price, $5.25.

The Mineral inquiry. Elements of a national mineral policy; prepared by the Mineral inquiry. Charles K. Leith, H. Foster Bain, S. M. Marshall. N. Y., 1932. vi+162 pp. tables, diagrs.

National research council. Division of anthropology and psychology. Committee on child development. Research in child development. 53 pp. appendix.

The Research association of British rubber manufacturers, Croydon, England. Library catalogue. Cambridge, W. Heffer & Sons, 1927. 210 pp.

RIESBECK, ERNEST WILLIAM. Air conditioning; fundamental principles, practical installations and Ozone facts. Chicago, The Goodheart-Willcox co., 1934. 352 pp. illus., tables. Price, $3.50.

Society for research in child development, Washington, D. C. Proceedings, 1st biennial meeting, 1934. ix+90 pp.

TOWNSEND, GILBERT. Carpentry; a practical treatise on simple building construction, including framing, roof construction, general carpentry work, exterior and interior finish of buildings, building forms and working drawings. Chicago, American technical society, 1936. 436 pp. illus. Price, $2.

WILLIAMS, JESSE FEIRING. Atlas of human anatomy, with explanatory text. Colored illustrations by Franz Frohse, Max Brödel [and] Leon Schlossberg. N. Y., Barnes & Noble [c. 1935]. 64 pp. col. illus. Price, $2.

REVIEWS

Atlas of Human Anatomy. By Jesse F. Williams. Barnes & Noble Inc., New York, 1935. 64 pp. illus. Price, $2.

The new Atlas of Human Anatomy by J. F. Williams is undoubtedly intended to furnish the layman with a brief but sufficiently comprehensive compendium of human anatomy. As an atlas for quick reference and as a refresher, the book extends its field of utility to students of human biology and to medical men as well. A perusal of the work will convince anyone of its special merits—compactness, accuracy, and magnificence in illustrations.

The usefulness of an atlas of human anatomy is so well recognized that such standard works as those of Spalteholzs and Basker, and Sobotta and Toldt, have long become the friends of students in dissection. Only their relatively high cost has prevented a more general adoption, to the regret of those teaching the subject. We welcome this particular atlas, because with the additional advantage of reasonable cost it will prove, in our opinion, one of the most popular books with medical students in their course in dissection.—M. L.

Organic Solvents; Physical Constants and Methods of Purification. By A. Weissberger and E. Proskauer. Translated from the German manuscript by R. G. A. New. The Clarendon Press, Oxford, 1935. 212 pp. Price, $5.

In this publication the authors have endeavored to collect the recent literature on the physical constants and methods of purification of a number of organic solvents.

The first part of this text contains a systematic classification of organic solvents. The second part has tables of physical constants of organic solvents and in this respect resembles a handbook. The third part gives methods for purifying solvents

Biological Processes in Tropical Soils. By A. S. Corbet. W. Heffer and Sons Ltd., Cambridge, London, 1935. 156 pp. 7s. 6d.

This book contains very interesting and valuable data on biological processes as concerned with tropical conditions. The geographic and climatic conditions with special reference to soil origin and soil formation of the Malay Archipelago are well discussed. Throughout the book the author lays special emphasis on the effect of the climatic factor on plant life and on microbiologic activities in the soil. The subject of soil organic matter is well presented. The nitrogen cycle is discussed thoroughly, showing the important steps of chemical reactions concerned.

Jenny's Law, which is concerned with the accumulation of nitrogen in the soil as affected by temperature and humidity, is discussed clearly.

The book is a source of valuable information for students of soil biology and soil chemistry. In the appendix are standard methods for soil examination. The physical, chemical, and biological analyses are briefly discussed.—M. M. A.

Automobile and Gasoline Engine Encyclopedia. By Andrew L. Dyke. The Goodheart-Willcox Co., Chicago, 7th ed., 1935. 1,240 pp. illus. Price, $6.

A complete automotive library in one volume, this book on American practice in automobile engineering and repairing gives special instructions on locating troubles, testing, and adjusting parts. It includes private, commercial, and tractor types with specifications, and thousands of diagrams, charts, and illustrations.

The book contains over 1,000 pages covering all classes of automobile information; over 4,000 pictures, plans, diagrams, and charts; a complete index of 79 pages; one section devoted to locating trouble on cars; special instructions on testing and adjusting every part of the automobile; specifications for gasoline passenger cars, trucks, and tractors; specifications for replacements, accessories, interchangeable parts, and equipment; charts showing working principles of the automobile, trucks, and tractors. This is an indispensable book for automotive engineers, auto mechanics, and machine shops.—R. M.

Acidosis and the Dietetic Treatment of Diseases. By Basanti C. Sinha. The Swasthya Sangha, Calcutta, 1935. 15 pp.

In this little pamphlet the origin of acidosis and the part which this condition plays in disease is discussed very briefly. According to the author, who is apparently not a medical man, many diseases, such as cholera, dysentery, diabetes, etc., "are

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cured not by treating the cases with drugs suitable for the diseases, but by treating them as of acidosis only." Great reliance is placed on the successful treatment of acidosis by proper dieting. For this reason a short list of acid and alkaline foodstuffs is given.—M. B.

A. S. T. M. Standards on Petroleum Products and Lubricants. Prepared by Committee D–2 on Petroleum Products and Lubricants. American Society for Testing Materials, Philadelphia, Pa., 1935. 358 pp. Price, $1.75.

The current edition, 1935, of Committee D–2 on Petroleum Products and Lubricants, includes all A. S. T. M. standards pertaining to petroleum in one volume of 358 pages. It contains 57 test methods, six specifications, and two lists of standardized definitions of terms, all of this material being given in its latest approved form.

The current report of Committee D–2 comprises an interesting discussion of the work on the Sligh oxidation test with a proposed method of test for oxidation number of lubricating oils and gives the revised Diesel fuel-oil classification which is published for information.

A new method of test given for the first time covers the vapor pressure of motor and aviation gasoline (Reid method).

—F. D. R.

Chemistry and Technology of Wines and Liquors. By K. M. Herstein and T. C. Gregory. D. Van Nostrand Company, New York, 1935. 360 pp. Price, $5.50.

This book gives modern methods of manufacturing various kinds of wines and beverages and their analyses. Various essentials of the alcoholic beverage industry, such as sugars, starches, enzymes, fermentation, yeasts, and malt, are discussed from both the theoretical and practical points of view. Many formulæ for the manufacture of liquors and cordials are given.

The book will be very useful for chemists and students specializing in the fermentation industries in particular and as a reference text in industrial chemistry in general.—F. A.

The Jew in Science. By Louis Gershenfeld. Jewish Publication Society of America, Philadelphia, Pa., 1934. 224 pp. Price, $2.75.

Persecuted in every land in which he sought to earn his living, denied the right to worship the God that his persecutors adopted for their own, downtrodden and despised, discriminated against and suffering untold mental and physical agonies, the Jew still made possible the discovery of the New World by

Columbus who also was half Jew. Quoting Prof. Herbert B. Adams, of Johns Hopkins, "Not jewels but Jews were the financial basis for the first expedition of Columbus."

The discovery of America was made possible because of the personal efforts and fortunes of Jews high in governmental positions. Columbus guided his ships across unknown seas by means of nautical instruments and astronomical tables invented and compiled by the Jews Abraham Zacuto, Levi ben Gerson, and Jacob ben Makir. His vessel in part was manned by Jewish sailors. That is history. Yet in the same year that a new empire was founded for her, Spain expelled the Jews from her soil!

The Jew was rigidly prohibited from attending European Universities and from engaging in any form of scientific endeavor as late as the middle of the nineteenth century. Though the flame of Jewish scholarship was for centuries not permitted to rise to a bright light, it nevertheless was not suffered to grow cold. It smouldered in every Jewish home, rising to its natural brilliance only when the Inquisition and political discrimination were withdrawn.

The Jews' contribution to the world's fund of knowledge, all through the ages, has been vast. It was accomplished without solicitation or encouragement on the part of the millions who benefited by it. It was done in spite of insurmountable handicaps and penalties. The Jews' objective was not mere personal reward, but service to man.

It is astounding how persistent the urge to heal has remained with the Jew. It antedates Christ by many thousands of years. How much more wretched and unhappy the world would be to-day without the epochal discoveries of the Jew Paul Ehrlich. What affliction and misery were imposed upon the hapless victims of syphilis until salvarsan was invented by this indefatigable Jew!

In the field of mental diseases an equally important contribution to the world was made by the pioneer psychiatrist Sigmund Freud. No less was the contribution made by Lombroso. If space permitted, hundreds of other Jewish names could be enumerated.

Other fields of science have been equally enriched by the fertile Jewish brain. A few sample names will suffice: Heinrich P. Hertz, Vladimir Michelson, the Herschels, and Einstein.

Political philosophy and economics have equally profited from such Jewish scholars as Gustave Cassel, Ignatz Jastrow, Harold J. Lasky, E. R. A. Seligmann, and Karl Marx.

The Jew has ever remained an enigma to a wondering world. Adversity has developed in him a deep sense of humanitarianism; a desire to relieve human suffering by means of both medical service and philanthropy. Adversity has not deadened but sharpened his active mind. With the advent of greater political, civic, and economic opportunities, the Jew will play an even more important rôle in science than in the past.—L. L.

Stars and Telescopes. By James Stokley. Harpers and Brothers, New York, 1936. 319 pp. Price, $3.

The author in his foreword states that the purpose of the book is to acquaint the ordinary visitor to a planetarium or observatory with the fundamentals of astronomy. This he has accomplished to a marked degree, stripping the subject of its classroom aspect without sacrificing truth or clarity. The book will satisfy the desire of the casual inquirer to know something about the heavens, and, at the same time, awaken and stimulate the interest of the more inquiring mind in the doctrines herein stated briefly. The chapters dealing with the history of astronomy and life in the universe are particularly well done. It is pleasing to find that the author knows how to distinguish between facts and theories, and takes a conservative view of the latter.—E. J. N.

The Application of Absorption Spectra to the Study of Vitamins and Hormones. By R. A. Morton. Adam Hilger, Ltd., London, 1935. 70 pp. Price, 10s.

This book contains a literature review on the application of absorption spectra to the study of vitamins and hormones.

The difficulty in getting pure materials naturally affects the accuracy of absorption-spectra studies. However, these data, which are largely empirical, serve as a supplement to the results of biochemical and organic methods of research.

The results obtained for the vitamins A, B_1, B_2, C, D, and the hormones have been compiled for this publication.—A. J. H.

The Rheumatic Diseases: Their Recognition and Treatment. By Francis Buch. Cassel & Co., Ltd., London, 1935. 436 pp. Price, $3.25.

The author emphasizes, first, the importance of appreciating the presence of certain, definite varieties of rheumatic diseases;

second, the need of knowing the natural history of each of them, laying special stress on their clinical recognition, including the value of bacteriological, pathological, and radiological findings; and third, the necessity of applying the well-known methods of treatment while being fully aware of their merits and limitations.

The first part of the book deals with the definition of rheumatic diseases, including anatomy, physiology, and pathology, and a chapter on the general investigation of the individual patient. The second part deals with the different rheumatic diseases, including their diagnosis, differential diagnosis, and treatment. The third part treats mainly of the different methods of therapy.

The book is worthy to be read by every medical practitioner.

—L. G.

The World of Nature. By H. C. Knapp-Fisher. V. Gollancz, Ltd., London, 1935. 512 pp. Price, 6s.

This book is a text on general biology intended for the layman. The author has made a bold effort to discard technical terms and to describe plants and animals in ordinary English. While an expert in one branch of biology may discover occasional inaccuracies in some parts, the value of the book as a whole with its broad outlook is in no way affected. The text is divided into four parts; namely, the seashore; an outline of the plant world; a simple survey of insect life; and fish, flesh, and fowl. The text should make a very interesting and useful reference book for students taking high-school biology, and for teachers of animal and plant life in the grades and in the normal school. Although the forms of life described are mostly English, the book is useful because of its methods of presentation.—H. A. R.

Small-fruit Culture. By James S. Shoemaker. P. Blakiston's Son & Co., Inc., Philadelphia, 1934. 434 pp. Price, $3.50.

The author of this well-produced and generously illustrated book points out in his preface that much of the information given therein embodies the results of experiments and researches under different field conditions. Although considerable information in regard to the culture of small garden fruits has been written, much has not found its way into print for the guidance of the small fruit grower. The author has performed a valuable work by bringing together the scattered data in a comprehensive volume, which will serve as a valuable guide for growers of

small or garden fruits; such as, grapes, strawberries, bramble-fruits, currants, gooseberries, blueberries, and cranberries.

Part I covers grape culture and deals with the general characteristics of the commercially grown grape varieties in Europe and in the United States, the modes of propagation, the soil and climatic requirements, and the planting and culture as practiced in various parts of the United States. In part II the author describes the development of the strawberry industry in the United States, and classifies the regions and strawberry districts as early, second-early, intermediate, and late crops. Bramble-fruit, currant gooseberry, blueberry, and cranberry cultures are dealt with in the remaining chapters. Although they are not cultivated in the Philippines, some of these crops have possibilities in certain regions of the Philippines, such as the Mountain Province and the highlands of Mindanao.—F. G. G.

New World of Chemistry. By Bernard Jaffe. Silver, Burdett & Co., New York, 1935. 596 pp. Price, $1.80.

This book gives a popular and very interesting account of elementary chemistry. Fundamental theories and the characteristic properties of the common elements and compounds are explained briefly and clearly. The historical comments concerning original investigators lend a personal touch that is inspiring to beginners. The many illustrations showing modern methods for producing commercial products are unusually good and depict the practical importance of chemistry. Information on timely topics, such as the stratosphere, Neon lights, stainless steel, shatterproof glass, vitamins, hormones, rayon, and cellophane, makes the book decidedly up-to-date. The teaching aids at the end of each chapter give the book decided advantage over similar textbooks on the subject.—A. P. W.

Chemotherapia del Cancro. By G. Fichera. Ulrico Hoepli, Milano, 1935. Paper, 213 pp. Price, 25 lire.

The author reviews the work of others in the treatment of cancer by the administration of lead in various ways, of other metals such as gold, and of dyes such as methylene blue and other vital stains, which he discusses from various angles.

Arsenic as advocated by the Frankfurt school was found to be well tolerated by the organism, but salvarsan was less so. Selenium appeared to be satisfactory. The author used other chemicals with the addition of amino acids. Sulphur and sulphur casein gave variable results. Copper was fair, especially

in the cutaneous forms of the disease. Lead is claimed to have reduced the mortality from cancer by as much as 25 per cent. It was used alone or in combination with *x*-ray application.

The author describes the findings of others with respect to hyper- and hyponutrition of tissues in connection with vitamins and hormones. He believes that biologic therapy exerts a definite influence upon the growth of tumors, and discusses extensively the action of the endocrine glands, such as the posterior lobe of the pituitary (Theelin), on the growth of tumors, as to which the opinion of observers is divided. In general the author is optimistic as to the future of chemotherapy in cancer.

The tables accompanying the monograph show the number and sex of patients treated, the types and locations of tumors, and the metals used in treatment, either singly or in combination, but most generally the former. There is a bibliography of more than 600 titles.—C. R.

The Rôle of Environment in the Life of Birds. By Samuel C. Kendeigh. The Duke University Press, Durham, N. C., 1934. (Ecological Monographs, v. 4, No. 3, pp. 299–417.) Price, $1.50.

In this dissertation Doctor Kendeigh certainly presents much food for thought covering the broad field of ecology. The article should be read carefully by naturalists in general and by field ornithologists in particular. Temperature, relative humidity, solar radiation, food, precipitation and wind, biotic interaction and competition, and physiographic features are discussed together with their effects on the behavior, distribution, migration, and abundance of birds. The discussions are supported by results of the author's experiments and observations, correlated with those of over 200 published titles. English sparrows and eastern house wrens were used largely in the study. Although the results will be best applied to temperate species, they involved important biological principles that are of great significance to naturalists everywhere.—C. G. M.